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THE  
ELECTRIC BATH

ITS MEDICAL USES, EFFECTS  
AND APPLIANCE

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BY

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## P R E F A C E.

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**I**N No 216 of "The Medical Record" (Dec. 15th, 1874) was published an article written by me, entitled "On some of the Uses of Galvanic and Faradic Baths."

The interest manifested in the subject, as evidenced by numerous letters of inquiry since received from physicians in almost all parts of the United States, and some in Europe, has induced me to write the present treatise, in which I have endeavored to present to the profession, as far as lies in my power, all that is necessary to a full comprehension of the electro-balneological treatment.

When it is considered that in the employment of electric baths I have been to a great extent groping in the dark, that I have been deprived of the advantage of having the experience of others to guide me, it will not appear surprising that I should have met with many disappointments. My failures have been illustrative of the fact that the electric bath is no more a panacea for all ills than any

other remedial agent. Applicable as it is to a great variety of pathological conditions, it meets with many where it is destined to have negative or at best imperfect results. Far from discouraging me, however, failures have served to inspire me with fresh ardor to seek for light, and to persevere in my efforts to establish on the basis of statistical truth, the therapeutic merits of the agent which I employed.

In view of the imperfectness of the results thus far obtained, I should consider the present work premature, did I not find a justification for it in my desire to induce other and abler observers to investigate the subject, and place it on whatever footing it may merit.

To say that I am fully conscious of the shortcomings of my work, would be but feebly to express my convictions in this respect. I beg the reader however to consider that the subject is not a hackneyed one, that mine has not been the work of the compiler who remodels the brain-work of others. It may be crude and rough, it may lack the gloss and polish that is the result of much handling, but I have at least the consciousness that it has the merits of originality and candor.

NEW YORK.

160 Second Avenue. November, 1876.

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# THE ELECTRIC BATH.

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## CHAPTER I.

### THE APPARATUS.

**T**O a proper comprehension of the succeeding chapters, it is necessary first of all to be familiar with the apparatus employed in carrying out electro-balneological treatment, and I therefore proceed to give a description of this.\* It may conveniently be divided as follows, viz.

- a.* The tub ;
- b.* The electrodes and connections ;
- c.* The water ;
- d.* Chemicals ;
- e.* The batteries.

\* A written description can never convey so true an idea of anything, as an ocular inspection. I will therefore say that it will afford me much pleasure to show any member of the profession the apparatus I am about to describe, at my residence.

(a) *The Tub.* This must be made of a non-conducting material. Of substances that will answer, I will mention: wood, porcelain, soapstone, vulcanized rubber, or glass. In choosing one of these materials, regard should be had to the facility of attaching the electrodes. In this respect wood deserves the preference over all the others mentioned. Where economy is to be studied, it has a further item in its favor.

The tubs, which I have now in use for nearly three years are made of wood, and I find them to answer very well. It must not be forgotten, however, that a wooden tub requires to be well painted on the inside, in order to prevent its becoming water-soaked, because in that event it would become a conductor of electricity, and interfere to some extent, with the administration of the electric current in the bath.

The shape and size of the tub may be the same as those of an ordinary bath tub. To suit individual cases however, its length may be made to vary. The only peculiarity in its construction is at the head. Here, instead of slanting, it is made square, and the slightly concave (from side to side) board against which the back of the bather is to rest, is fitted in afterwards. This is necessary, because it is very difficult to make a wooden tub with a slanting back

water-tight. If the length of the tub from outside to outside is made to measure about five feet ten inches, the back-rest fitted in at a proper slant will bring the inside of the tub to about the right length for an average male adult. All around the upper edge of the tub runs a wooden coping, which must not be fastened down however until all the attachments for conducting the current are *in situ*. Along that portion of the top of the tub where required—and this will depend on the situation of the binding posts presently to be mentioned—and underneath the coping, runs a groove for the reception of the wires that are to connect the carbon electrodes on the inside of the tub with the binding posts on the outside. This groove is continued vertically along the inside of the back-rest and foot of the tub respectively, to communicate at either end with the bed for the reception of the carbon plates. These vertical grooves should at their lower end be a little over  $\frac{1}{4}$  inch deep, in order to admit of the wires being introduced beneath the carbons.

The face of the foot of the tub and that of the back-rest, should have in their centres (from side to side) and commencing at about five inches from the bottom of the tub, a bed for the reception of the carbons. The dimensions of these receptacles must



ing of the wires by means of which communication is to be established between the electrodes and the binding posts, I shall term the end of the wire that is to be attached to the electrodes the distal, that which is attached to the binding posts the proximal end. A gimlet hole sufficiently large to admit of the passage of one wire should be made half an inch outwards from the centre of the site of each binding post. The best wire to use is about No. 16 copper wire, coated with gutta percha or rubber. The site of the posts being as above suggested, it will be found that the wire which is to connect the head electrode with one post requires to be about 18 inches long, that which runs from the other post to the foot-electrode, between eight and nine feet. The distal ends of the wires should be stripped of their coating for a length of about three inches, the proximal ends for about two inches. The denuded portion of the distal ends should be rolled up in the form of a spiral coil; this will insure their constant impinging on the carbons more certainly than could be expected from a simple straight end of wire.

The carbons having now been fitted in their beds, the distal end (coil) of the head wire is placed beneath the carbon, and the wire itself continued up along

the vertical groove to either one of the gimlet holes. Through this, from within outward, the proximal end of the wire is now drawn and left for the present. The distal end of the second wire having now been placed beneath the carbon at the foot of the tub, this wire is continued up through the vertical groove, along the upper edge of the foot of the tub to the side nearest the binding post to which the wire is to be attached, along the groove on the upper edge of this side to the head of the tub, and thence to the respective gimlet hole, and through this, from within outward. The wires being now all in position, all the coping is next screwed or nailed down firmly, care being taken that the screws or nails used for this purpose do not injure any of the wires. The coping fastened down, the binding posts are now screwed down in the sites previously marked out for them. Before they are screwed *entirely* down, the denuded portion of the proximal end of each wire is securely wound around the screw of the respective binding post, and the posts are then *firmly* screwed down, holding the proximal ends of the wires in place. Connection is now established between the binding posts and the head and foot electrodes respectively. The vertical grooves are now to be filled in with putty and painted over, care being taken to

keep the carbon free from paint. The last step towards completing the apparatus is to fasten the carbons in their beds. The simplest way of doing this is by stretching over each carbon a piece of muslin, folded double, and tacking this down around the edges. Zinc or galvanized iron tacks are best. Copper tacks should be avoided on account of their superior conductivity.

In order to be able when required to localize the current in special portions of the body, it is well to be provided with what I have termed a "surface board." This is a piece of black walnut, say 14 in. long by 5 in. wide,  $\frac{3}{4}$  thick, having in the centre a bed to accommodate a carbon plate, say 5 in. long by 2 in. wide,  $\frac{1}{4}$  thick. From the centre of this bed a gimlet hole pierces the board. The denuded end of an insulated wire is drawn through this gimlet hole from without inward (toward the bed) and twisted in the form of a spiral to prevent its slipping back, as well as to insure its more certain connection with the carbon. The carbon is now placed in the bed, and kept there by a piece of muslin drawn over it and tacked down. The wire should be of sufficient length to reach the battery. I shall speak further on of the use to be made of the surface board.

c) *The Water.* The quantity of water may be

the same as that in an ordinary bath. In those cases alone where it is intended to localize the current by means of the surface board, and to concentrate it *very strongly* in one spot, the water in the tub should be left low enough to leave the particular spot to be treated uncovered by this; the surface board can then be applied to this spot without the loss to the current of strength, through derived currents, inevitable in its application under water.

The temperature of the water may range from 85° to 105° Fahrenheit. As a rule the comfort of the patient may be consulted in this respect. There are certain cases, however, where an especially high or low temperature is indicated, and where the extremes mentioned have to be touched.

d) *Chemicals.* Where these are added to the water of the bath, it is for one of three purposes: viz. 1)—To exercise a direct therapeutic influence on the patient, either internally by being absorbed, or externally by their action on the skin; 2)—Through chemical affinity to aid in eliminating certain metallic substances from the body; or 3)—To further the absorption of morbid deposits. The various indications in these respects will be treated of in their proper places.

e) *The Batteries.* In the choice of this, the

most important part of the electro-balneological apparatus, the greatest circumspection is necessary. Inferior instruments and such as are liable to get out of order frequently, have time and again been the means of discouraging the beginner in electro-therapeutics, and causing him to abandon the study of an art, the pursuit of which would have well repaid him for all his labor. Fortunately our manufacturers here in New York turn out very good instruments, and if a physician purchases an inferior one, the fault is his own.

Two different currents are required for the baths, viz. 1)—The galvanic, which may be employed either in the constant or interrupted (by means of a rheotome) form; and 2)—the faradic or induced current. Several manufacturers of this city turn out good and serviceable faradic instruments. Those which I have been in the habit of using for some years past are manufactured by the Galvano-Faradic Manufacturing Company, and they have given me unvarying satisfaction. By means of a recently introduced attachment to their batteries, termed the "fine adjustment," a current of exquisite "finess" (rapidity of interruption) is obtained, thus removing the only inferiority that has heretofore distinguished American from the best imported

instruments. The instrument is very easy of management, and its liability to get out of order very small.

As however the galvanic current is of vastly greater importance in a therapeutic respect, than the faradic, so also much greater care is required in the choice of a galvanic than a faradic battery. In making choice of a galvanic battery, we have to consider its relative quantity, intensity, constancy, permanency, economy of running expenses, and facility of management. We cannot be guided here by the same considerations that guide us in the choice of a battery for office use, where the *séances* are usually brief and the elements taxed not nearly so much as in the administration of baths. It is not within the scope of this work to enter into a description of the various galvanic batteries that are in use. Neither do I believe that, in a therapeutic sense, there is much difference between the various batteries ordinarily found described in text-books on electro-therapeutics.

Where the battery is to be stationary, a zinc-copper battery, such as the Hill battery for example, is preferable both on account of its constancy and the economy of running it. Of this there should be fully sixty cells, communicating with the bath through a

current selector, by means of which the current from any desired number of cells can be obtained. The electro-susceptibility of different individuals varies to such an extent that this is absolutely necessary. Where a portable battery is desired, the Stöhrer zinc-carbon battery will be found the most useful.

I have mentioned these two batteries simply because I have them in use, and they give me satisfaction. There are many others, however, that will answer equally well. On the whole, any battery possessing quantity and intensity in a medium degree will answer.

## CHAPTER II.

### MODE OF ADMINISTRATION.

I SHALL describe under this head the *modus operandi* of administering a routine galvanic or faradic bath. As it will become necessary to describe special modes of administration when speaking of the electro-balneological treatment of special diseases, the describing them now would only lead to tautologies that I am desirous of avoiding.

Taking our cue from the indications to be met in each case, it becomes necessary, according to circumstances, to use either the galvanic current, the faradic, or both successively. As modifications of the application of the currents we have to consider 1) their intensity; 2) their direction, and 3) the duration of the application.

The intensity of the galvanic current corresponds directly to the number of cells from which it is derived. It were vain however to attempt to express this in figures, because the electro-motive force of different batteries varies to so great an extent, that a



number of cells of some batteries of low intensity yield a current so feeble as to be barely appreciable in the bath, while the same number of cells of a battery of high intensity, furnish a current that few persons can bear without pain. In thus comparing the Hill cell with the Stöhrer cell, I have found the ratio to be about as 1 to  $2\frac{1}{2}$ , i. e., as intense a current can be derived from twenty-four Stöhrer as from sixty Hill cells—and this is rather below than above the mark. Were all batteries alike in this respect, however, still no particular number of cells could be given as furnishing a current of suitable average intensity for the galvanic bath, because of the excessively great variations in the degree of electro-sensibility of different persons. This is so marked that I have seen persons in the bath tub who could bear no more than six Hill cells, diffused as was the current from these through the water and over the entire body; while on the other hand I have met with male patients on whom a current from thirty-two Stöhrer cells made not the slightest impression, and where I was compelled to supplement the current by that from a ten-cell quantity battery (zinc carbon elements 6 in. long by  $4\frac{1}{2}$  wide) in order to make them realize the presence of a current. These gentlemen had no cutaneous anæsthesia.

In view of the facts just stated, I have found it impracticable, when giving directions for the administration of a galvanic bath, to indicate any certain number of cells to be used. I am in the habit of ordering the administration of a "mild," a "medium" or a "strong" current, as may be required in the respective cases; and in every instance it is the electro-sensibility of the patient that determines the number of cells requisite to obtain the desired result as represented by one of these terms. The same applies also to the faradic current.

To determine the direction of the current is sufficiently simple. Where a descending current is desired, the binding post which represents the electrode at the head of the tub must be connected to the positive pole of the battery, the other binding post to the negative pole; where an ascending current is desired, the reverse of this is done.

The duration of the bath varies with different cases. The average is about twenty minutes, though the time may range from ten minutes to an hour and a half.

Where it is desired to give the patient a galvanic shock, it is only necessary rapidly to reverse the current by means of the commutator. The simultaneous contraction of almost the ENTIRE muscular

system that accompanies the reversal of a current of sufficient intensity in the bath, affords a striking illustration of the *general* effects of the galvanic bath. In cases where paralyzed muscles have lost their faradic irritability, galvanic interruptions are almost indispensable to successful treatment.

I have before (page 14) described a "surface board," which I have devised for the purpose of localizing the current from one of the poles in any portion of the body where required. This proceeding should by no means be looked upon as a "local" method of electrization; on the contrary, it is just as much "general" as the ordinary electric bath. Whereas in local applications the current runs from one point of the body to another, in this case, supposing the spot where the surface board is applied to be the centre, and the rest of the body the periphery, a current runs between *every point* of the periphery and the centre, its direction being centripetal when the surface board communicates with the negative, centrifugal when with the positive pole of the battery.

The current is felt more or less intensely in proportion to the proximity to the body of the surface board. With the galvanic this is less noticeable than with the faradic current. When, for example, a fara-

dic current of medium strength being employed, the surface board is held about six inches from the abdominal surface, little or no current is felt. Let the surface board be now gradually approximated to the abdomen, and the current will be felt more and more sensibly, until, when about an inch away from the skin, or touching this, its influence becomes so strong as to cause more or less energetic contractions of the abdominal muscles. Where the galvanic current is employed, the skin beneath the surface board will be found more or less reddened after a few minutes' application; the burning sensation ordinarily accompanying galvanic applications will also be experienced more or less intensely, in proportion to the strength of the current employed.

Where the current is to be concentrated in a manner still more energetic than that described, this can be effected by raising the objective part above the surface of the water, and then applying the surface board. In this way the *entire* strength of the current is concentrated in one spot, whereas, when the surface board is applied under water, a large portion of current is absorbed by this.

This appears to me the fittest place to say a few words in regard to the relative conductivity of the human body and water—the latter at the tempera-

ture ordinarily employed in baths, say from 90° to 95° Fahrenheit. BEARD and ROCKWELL, in their work on Medical and Surgical Electricity,\* state that "the human body is a better conductor of electricity than water at the same temperature." Certain phenomena connected with the administration of electric baths having forced upon me some doubts in this respect, I made very careful experiments, both with and without the aid of the galvanometer (Bradley's Tangent), to satisfy these. Without wearying the reader with details, I will state that the result of my experiments leaves no room for doubt that water at the temperatures stated—and still more so at 98½°—is superior to the human body as a conductor of electricity. I do not mean to be understood that water is a better conductor than *every constituent* of the human body; blood, for example, is a better conductor. But when I speak of the body in this connection, I take it as we find it practically, i. e., with the resistance of the skin, and especially the epidermis, superadded to internal resistances. I have no doubt that with a flayed individual it would be otherwise. I will add, that it will give me great pleasure to repeat these experiments, which are

\* "Medical and Surgical Electricity." New York. 1875. Wm. Wood & Co. pp. 431 and 432.

sufficiently simple, in the presence of any of my *confreres* who feel an interest in the subject.

Having thus cursorily considered the manner of using the electric current in the administration of a "routine" bath, and there being no remarks required concerning the water employed, in addition to what has been said in the previous chapter, a few words are in place on the subject of chemicals. As has been previously stated (page 13) these are added: *a*) to be absorbed, and thus act medicinally on the patient; *b*) to act on the skin; *c*) through chemical affinity to facilitate the elimination from the body of certain metallic substances, and *d*) to further the absorption of morbid deposits. Of the many drugs and medicines that no doubt may be made to answer these various purposes, I have had personal experience with but few, and of these I will mention the leading ones only. A requisite of all chemicals to be employed is their ready solubility in water. Of substances intended for absorption\* I have used but three, viz: iron, iodine, and extract of malt. The first of these I have employed

\* For some experiments concerning the cataphoric effects of the galvanic current, see an article by MUNK, entitled "Ueber die galvanische Einführung differenter Flüssigkeiten in den unversehrten lebenden Organismus," in the Allgemeine Medicinische Central-Zeitung, No. 16, 1875.

in anæmic and enfeebled conditions generally, but especially in chlorosis and chlorotic hysteria, with marked success. It has the advantage, when administered in this manner, not only of sparing the alimentary canal the frequently injurious task of becoming the medium of its assimilation, but, in addition to this, I believe that it can in this way be introduced into the blood much more rapidly and in larger quantities than when given by the mouth. The preparation which I have found, all things considered, the most eligible for this purpose, is the "tartrate of iron and ammonia." This is very readily soluble, leaving no deposit, is assimilable, and not too expensive for the purpose. As, in my experience at least, it leaves nothing to wish for, I would consider it superfluous to discuss in this connection any of the other ferruginous preparations.

Iodine I have employed with a view to its absorption in rheumatism and gout. I cannot speak favorably of it in this connection. I have not in a single instance found a bath charged with iodine, either in the form of the tincture or of iodide of potassium, followed by results in any way differing from those of the simple galvanic bath employed in the same cases.

Extract of malt I have employed as a roborant,

either alone or in conjunction with iron, in cases of debility and malnutrition, and found it of service.

Where the absorption of substances is aimed at, the *galvanic* current must be employed.

Where we add substances to an electric bath with a view of producing some special action on the skin, we may be guided by the same principles that govern ordinary balneology. Thus to obtain counter-irritant effects, we may add mustard or common salt ; to render the bath alkaline, bicarbonate of potassa or soda, etc., etc.

An important object to be furthered by the addition to the galvanic bath of chemicals, is the elimination from the system of certain metallic substances. It will be found here that in practice we have to deal chiefly with two substances, viz : mercury and lead. That the elimination of these bodies by means of the galvanic bath is feasible, I shall endeavor to demonstrate further on. At present I have simply to consider the chemicals adapted for the purpose, and the manner of using them.

To facilitate the extraction from the system of mercury, nitric-acid has been recommended by those who have heretofore instituted this treatment. While I cannot positively deny that this substance may aid in the elimination of the metal, I am com-



pelled to state, after its trial in several cases, that I have obtained equally good results from the simple galvanic bath. In the light of my own limited experience, therefore, I cannot insist on the necessity of adding any chemical to a galvanic bath which is administered for the purpose of extracting mercury from the body.

Where the elimination of lead is the object aimed at, I am, on the other hand, satisfied of the utility of adding certain chemicals to the water of the bath. Sulphuric acid has been suggested and used for this purpose. I can say nothing respecting its usefulness, as I have never tried it. Indeed, the results with iodide of potassium added to the bath have been so satisfactory, that I have had no occasion to try any other chemical, although almost any other of the preparations of iodine would probably answer equally well. The chemical affinity of iodine for lead affords a ready explanation of its usefulness in this respect. One ounce of iodide of potassium to each bath appears to me a suitable quantity.

I have had no personal experience with any other cases of chronic metallic intoxication than those with lead and mercury.

The absorption of morbid deposits (plastic exudations, etc.) can be materially furthered by add-

ing to a galvanic bath some resolvent—above all, iodine.

I have said above (page 26) that I had found no perceptible benefit from the addition of this substance to the galvanic bath in cases of rheumatism or gout. The contrary holds good however with respect to the frequent sequence of these diseases—articular deposits. When the acute, and to a great extent the sub-acute symptoms have subsided—and in chronic cases especially, and the disease has left effusions in various joints, iodine, which when employed in this manner, appears to have little or no influence on the pain accompanying these complaints, is a powerful adjuvant in promoting the absorption of the deposits. In chronic synovitis and all other articular affections accompanied by exudation, the same holds good.

I have no doubt that future advances in this branch of science will develop the utility of numerous other drugs and chemicals as additions to the galvanic bath.—Before leaving this subject I must call attention to the influence which the addition to the bath of certain substances has on the conductivity of the water, resp. thus: the action of the current on the patient. I have found that when I caused salt or bicarbonate of soda to be added to

the bath, the conductivity of the water became so much increased, so disproportionately greater than that of the body, as to render necessary the employment of very powerful currents in order to cause the patient to feel them.

## CHAPTER III.

### PHYSIOLOGICAL EFFECTS.

**I**N accordance with the plan of the present work, the remarks I shall offer under this head are by no means intended to comprise all that is known at the present day of the physiological effects of electricity in general. It was my purpose when I undertook to write these pages, to offer to the profession a book confined to one subject; not a compilation, but a volume made up almost if not wholly of original matter, chiefly, if not entirely the result of my own observations and experience. For the general physiological effects then of electricity as well as for the theories of its action, I refer those interested to the many excellent works on the subject that have appeared within the last few years. I will treat here only of the physiological effects peculiar to the electric bath.

The daily observations that I have had the opportunity of making in this respect, extending as they do over a period of upwards of two years, have

not been as fruitful of results as might be expected. This is due mainly to the circumstance that but a small percentage—and these took the baths merely as a refreshing tonic—of those whom I have had the opportunity of observing, were in a condition that might be called normal. By far the greater majority were suffering from some complaint, in most instances of a neurotic or rheumatic nature, the presence of which, while it afforded admirable opportunity for observing therapeutic results, modified more or less the physiological effects of the baths; and served to deprive them of a uniformity which might to a great extent justly be looked for in healthy organisms. If, therefore, what I now contribute to the physiology of the subject is but little, it will I trust be at least found of practical utility in its applicability to the therapeutics of the subject.

Before entering into details, it is necessary in the first place to inquire in what respects electric baths differ from other methods of electrization—especially those recently introduced as “general”—that their physiological effects should merit individual consideration. They differ in two ways. One of these is self-evident. To the effects of electricity are super-added those of the warm bath. The effects of the warm bath *per se* are too familiar to every physician

to require comment. Its effects in combination with electricity, however, may not be so generally known; and I therefore feel justified in quoting here a passage that bears directly on the subject, from a recent German work by Dr. Hartmann\* of Wiesbaden.

“The last question, whether mineral water acts also by contact with the skin, leads us to one of its most important effects—that through electricity.

“Although this question has not as yet been finally disposed of, we have still advanced far toward its solution, through the admirable researches of HEYMANN and KREBS. Both observers have furnished proof that the contact of the water of the bath† with the human body gives rise to electric currents, which currents must be looked upon as being the excitors of the nerve-currents, the body acting merely as a conductor. From these experiments we conclude that no particular difference obtains between artificial and transported waters on the one, and natural waters on the other hand, the assertions of SCOUTETTENS notwithstanding, who in regard to electricity claimed to have found a difference between the artificial and transported waters and the natural ones.

“We gather moreover from the experiments, that the electric current generated through the contact of the body with the water of the bath is modified chiefly by the gases, next by the temperature of the water, and lastly only by its salts.

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\* Dr. Franz Hartmann; “Der acute und chronische Gelenk-rheumatismus,” Erlangen, 1874; pp. 194 et seq.

† The Author here refers to mineral-water. Dr. S.

"The effects of the bath depend on the strength of the electric current generated and on the condition of the peripheral endings of the nerves; the effect may be stimulating or soothing. The strength of the current is governed, as we have seen, by the quantity of gases present, the temperature and the salts. Ordinary lukewarm baths, indifferent baths containing a small amount of gases, are less stimulating than mineral baths containing a larger proportion of gases.

"With regard to the relative condition of the peripheral nerve-ends, experiments on the motor nerves go to show that swelling of the terminal ends of these nerves may diminish their excitability to the point of its complete extinction, while it becomes increased by their exsiccation. This fact as to the motor nerves is adopted by HEYMANN likewise as applying to the nerves of sensation. If, now, we presuppose absorption or even imbibition on the part of the skin, a swelling of the nerve-ends is comprehensible, as the imbibed fluid reaches them. But, according to HEYMANN, the peripheral nerve-ends, i. e., the terminal bulbs of KRAUSE, of the sensory nerves, and the tactile corpuscles of MEISSNER, become even without this presupposition sufficiently impregnated with water while in the bath, because here all insensible perspiration must cease, and in a bath of a temperature lower than blood-heat transpiration cannot take place, so that all transudation to the skin being retained during the bath, those termini are surrounded by moisture and therefore swell up.

"From this the writer concludes with regard to the effects of the baths, that all baths in which the electric current produced by contact of the water with the body preponderates over the swelling of the nerve-ends, have a stimulant effect,

while those baths where the swelling preponderates over the electric current, act as a sedative.

“Taking a brief and comprehensive review therefore of the effects of mineral water baths, we have those resulting from the temperature, from the contents of carbonic acid and salts, and lastly from the electric current generated in the bath water; each effect however resolving itself into an excitation of the peripheral nerve-ends, which leads in a reflex manner to an enhancement of the change of matter.”

From the foregoing quotation may be realized the importance which is attached to the electric current in the warm bath. And here let me ask the question: May not the remedial superiority, in many cases, of the mineral water bath over the ordinary warm bath be due mainly, if not solely, to the more abundant generation in the former of electricity? Or rather, is it not very likely that this is so? And if such is the case, it would appear evident that the mineral water bath, the electric properties of which, depending on the chemical changes going on between the gases and salts of the water on the one, and the cutaneous secretions and other constituents of the body on the other hand, are to a great extent beyond our control, must in turn be vastly inferior to a bath where the electric current is under our perfect control, and can be modified in intensity, direction and quantity to meet the indi-



vidual requirements of every case. And such is the electric bath I am now describing.

The second difference between the electric bath and all other methods of applying electricity is, that *the bath is the only method by means of which general electrization can be realized*. In making a distinction in this respect, it becomes necessary for me to advert more especially to a method first introduced to the profession in a systematized and scientific manner by Drs. BEARD and ROCKWELL,\* and termed by them "General Faradization." The undoubted good results that have been obtained from this method—for the details of which I refer the reader to the latest work of the authors†—have caused it to be extensively adopted by the medical profession, both here and in Europe. It is, however, not with its results that I have to do at present, but with its appellation and true nature. General faradization, so-called, consists of a series of local faradizations, administered during one and the same *séance*, until the current has alternately been made to impinge upon and traverse the entire or at least

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\* The Medical Use of Electricity, with special reference to general electrization as a tonic, etc. New York, 1867.

† Beard and Rockwell; Medical and Surgical Electricity. N. Y. 1875.

a large portion of the body. This cumulative procedure, it is true, approaches general electrization, as represented by the electric bath, more closely than any of the other local methods; yet it is not that which its name would imply, and I do not think it requires argument to make it apparent, that even this procedure differs vastly from the electric (whether galvanic or faradic) bath, where the current at one and the same time impinges directly on every peripheral nerve-end (excepting those of the head and face) and traverses every part of the body, obtaining—both as to reflex and direct effects—as a whole that which the method known as general faradization seeks to obtain by the cumulation of fractional portions.

Having thus, I trust, established the individuality of the bath as an electric method, I will without further digression proceed to the consideration of its physiological effects.

The physiological effects of the electric bath may be qualified on the one hand as either "immediate," or "remote," on the other as either "transient" or "permanent." Strictly to classify these is impracticable, and I will therefore be influenced in the order of their enumeration principally by their importance in a therapeutic respect.

One of the most pronounced as well as uniform, and at the same time most important, effects of the electric bath, is its property as an

#### HYPNOTIC.

This somniferous influence, which is to some extent exercised by local electrization, is here distinguished by its far greater constancy as well as by its greater degree of perfection. That this difference should exist, appears quite natural, when it is considered that the same topical influences which produce it in local electrizations, and which I shall presently endeavor to analyze, are here brought to bear on the entire system. The hypnotic effect is both immediate and remote, and more or less permanent. When there is an immediate inclination to sleep, which may make itself manifest during the bath or immediately after this, it is generally accompanied by a

#### PLEASANT SENSE OF FATIGUE,

which cannot be likened to weariness, but rather to what we feel after moderate exercise; it is only in some instances, where an individual takes his first bath, or where, for therapeutic reasons, a strong faradic current—accompanied by responsive muscular contractions—is employed, that this feeling is inten-

sified sufficiently to become unpleasant, calling for rest and recuperation, and must here be looked upon as analogous to the effects of *severe* exercise. It invariably disappears after a brief rest.

Experience and good judgment will enable us moreover in almost all cases to avoid effects of this kind. The immediate inclination to sleep is much more decided as well as constant when the bath is taken late in the day, than when taken in the forenoon. When the latter is the case however, the individual will as a rule become sleepy during the afternoon, or else at an earlier hour than usual in the evening, and sleep more soundly during the night. This is the effect of one bath. A series of baths will however produce more or less marked and permanent improvement in the sleep of individuals, where this has been below the normal standard. And this is among the most invariable of the effects of the electric bath, whether galvanic or faradic.

I have formed a theory as to the *rationale* of this influence, which I will offer as its probable explanation. We all know that sleep is a process designed by nature for the recuperation of the system after a certain period of activity. In other words, when the various functions have been more or less exercised for their daily allotted time—say seventeen hours—

the respective organs need that profound rest which we know as sleep. Now, it is pretty well conceded by physiologists, that electricity stimulates the secretory as well as excretory organs; that it furthers endosmosis and exosmosis—by its electrolytic influence in a physical, by its influence on the nervous system in a catalytic manner, in short, and by virtue of these properties, that it greatly

#### ENHANCES THE CHANGE OF MATTER

and incites the various organs to so great an activity as to cause them to perform in a comparatively brief space of time—say an hour, the work of several hours. The natural sequence is obvious: *The want of rest—of sleep, is felt at a correspondingly earlier period.* I offer this as a probable explanation of the immediate or almost immediate disposition to sleep. As to the permanent improvement in sleep, where this has been below the normal standard, it must always be due to the removal of some morbid condition, and thus belongs among therapeutic results, rather than physiological effects. It is true that in many instances of *agrypnia* we are unable to discover any pathological condition that would account for this symptom; but the probability is that here there is a sluggishness of some one or more of the func-

tions, mental or physical, too obscurely manifested to be discovered by our present means of diagnosis, yet reached and rectified by a mode of electrization that traverses and permeates *every* portion of the body.

If this explanation of the hypnotic effect of the electric bath be not the true one, it is at least—so far as I know—the first attempt at accounting for a phenomenon that has been noticed as a result of even local applications of electricity by many observers, and about the pretty uniform occurrence of which there can be no doubt.

With respect to the effect on the

#### TEMPERATURE AND PULSE,

I have made a number of observations, of which I have recorded twenty-two, made on persons where both were at or nearly at the normal standard. With regard to the frequency of the pulse, the results were conflicting and by no means reliable. In the majority of cases there was an increase, immediately after the bath, ranging from four to eighteen beats per minute. In others there was no change whatever, and in a few there was an absolute diminution in frequency; this last I believe however to be a therapeutic rather than physiological effect, manifesting itself only where there is pneumogastric asthenia,

and attributable directly to electric stimulation of this nerve. Thus in one instance, which occurred in the person of a physician of this city, who had an intermittent pulse, the result was as follows: Immediately before bath: pulse 70, two intermissions; at the expiration of 15 minutes, during which he was under the influence of a descending galvanic current: pulse 65, two intermissions; at the end of ten more minutes, during which he received the faradic current: pulse 65, no intermissions; ten minutes after leaving the bath: pulse 66, no intermissions. As a rule then, we may look for an immediate and more or less transient moderate increase in frequency of the pulse. As for any permanent increase or reduction of the pulse, there is none as a physiological effect. Where such an one does take place, it is by the removal of some morbid influence on the heart, and must be looked upon as a therapeutic result.

With respect to the temperature, the results were somewhat more uniform. I have found that where this is either normal or slightly below, the immediate but transient effect is to raise it from 2 to 6 tenths of a degree (Fahrenheit)—in most instances 4 tenths. In a very few cases it remained unchanged, and in one case, where before the bath

the temperature was 100, at the close of the bath it was 99 $\frac{3}{4}$ . Of permanent modifications of the temperature, the same holds good that I have said of permanent changes in the pulse. It must not be forgotten that the temperature of the water is undoubtedly an important factor in modifying the temperature of the body. In almost all instances where my observations were made, the temperature of the water was below that of the body, being 95° or a little less. This, which has a tendency to lower the bodily temperature, is to some extent counterbalanced by the suppression of the insensible perspiration, so that modifications of temperature resulting from electric baths, the water of which is but few degrees below 98 $\frac{1}{2}$ °, may justly be attributed to the influence of the electric current. The importance of the electric bath as a

#### PHYSIOLOGICAL STIMULANT AND TONIC

cannot be overrated. I deem it superior in this respect to any other known agent. This effect manifests itself *immediately* by a feeling of exhilaration and unwonted vigor, *remotely* by an improvement—where there is a margin for such—in the performance of some or all of the physiological functions, as well as by a gradual but nevertheless marked *increase in weight*.



Most striking among the tonic influences of the baths, are those that occur within the sphere of the digestive and sexual apparatuses. I will first consider the effects on

#### THE DIGESTIVE APPARATUS,

which may be subdivided into those on *a*) the appetite, *b*) digestion, absorption and assimilation, and *c*) alvine excretion. The improvement of the appetite under electro-balneological treatment is one of the most constant effects of this. While a series of baths will produce permanent results in this respect, an increase of the appetite, in some instances amounting to positive hunger, is a tolerably uniform and more or less immediate result of each separate bath. The permanent improvement of the appetite is relative. Not very appreciable where this is normal, it becomes most marked where the appetite has from some cause been impaired. The effect on the appetite is *definite*. The effects on absorption and assimilation are *presumptive*; but when we couple the absence of any corresponding difficulty in digesting the increased supply of food, with the increase before alluded to in the weight of the body, their assumption becomes fully justifiable. It is these combined

influences that make the electric bath so valuable a remedy in almost all forms of dyspepsia.

The influence on the alvine process is if anything even more marked than that on the assimilative process. Where the action of the bowels is normal, it is not modified permanently by the electric bath, although we often have, as an immediate consequence, a cathartic effect that manifests itself as a more or less watery evacuation, either a few hours after the bath or on the succeeding day. Where the fecal process however is sluggish, the improvement resulting from the baths is very striking. I shall recur more fully to this subject under the head of constipation.

The effects on the various functions connected with digestion are due doubtless to the combined influences of stimulation of the secretions of the alimentary canal and stimulation of the muscular coats of the stomach and intestines, as well as permanent tonization of the *muscularis*. While the enhancement of the secretions is undoubtedly due chiefly to the electric stimulus to the secreto-motor nerves, and the increased activity of the muscular coats to a like influence transmitted to their motor nerves, I believe the permanent tonization and invigoration of the muscular fibres to be mainly attributable to the

direct trophic influence of the current traversing the parts themselves; and I have no doubt that this direct influence has much to do with the stimulation of the secretions and *peristalsis* also. At any rate, I have never obtained from galvanization of the nervous centres, which I have practiced in a great number of cases, the striking effects on the alimentary processes which are so uniform a result of the baths.

The influence on the

#### SEXUAL APPARATUS

of the electric bath does not manifest itself in so striking a manner as in the case of the organs of digestion. It is true I have seen individuals whose sexual functions were normal, have *stysis* in the bath, but the mere cutaneous irritation of the electric current is here sufficient to account for a phenomenon which, where sexual irritability is intact, will follow any other local irritations.

If not as immediately perceptible, the stimulant and permanent tonic and invigorating influences on the sexual organs are not much less constant than the corresponding influences on digestion. Careful observation, however, of a considerable number of cases where the sexual function was more or less impaired, has convinced me that while there can be

no doubt that *direct* influence on the innervation, tone and nutrition of the respective parts as well as the stimulus which the electric current furnishes to the seminal secretion, bear a share in the improvement that takes place, permanent beneficial results must be looked upon as chiefly the expression of improved nutrition and tonization of the system at large. I do not mean to be understood as wishing to put in negation the beneficial results that the local influence of electricity is capable of sometimes accomplishing in the sexual sphere. These results, however, are not of a physiological, but rather of a purely therapeutic nature, and are obtained there only where local morbid conditions exist. Now, in the great majority of the cases that have come under my observation, the causes of deterioration of the sexual capacity, though frequently obscure and indefinable, were certainly not local, but to be sought for in the general—most probably the nervous—system. In none but perhaps the very mildest and recent cases have I ever seen *rapid* results follow electrical treatment of any kind whatsoever. In support of my assertion however that in the majority of cases the sexual sphere can be influenced only through the system at large, I will state *first*, that I have seen cases where local electrical treatment had utterly

failed to do the slightest good, respond favorably to the baths, and *second*, that where success was met with, it was only after persistent treatment, continued long enough to modify favorably the condition of the entire organism, and through this the objective sphere.

The stimulant and tonic effects under consideration, although shared to some extent by other methods of electrization, are here far more comprehensive and pronounced, a fact which is not surprising, when we reflect that in the electric bath not only are all the organs *indirectly* influenced through stimulation of the nervous centres, but each separate organ is at the same time *directly* acted upon by the current.

A direct sequence of the stimulant and tonic effects of the electric bath is its

#### SEDATIVE INFLUENCE.

This sedative effect, whereof the hypnotic effect already spoken of is the supreme manifestation, must not be associated for a moment with any idea of depression, for here we have none such. In addition to what I have already said in endeavoring to account for the hypnotic influence of the baths, I refer the reader for further information to the ad-

mirable and lucid remarks on this subject by BEARD and ROCKWELL.\*

The *galvanic* bath shares with other galvanic applications made in the cranial and upper spinal region, the effect of producing the galvanic *taste*, as also the *flashes* when the current is interrupted, showing that the

#### CRANIAL NERVES

come within the sphere of its influence.

A further effect peculiar to the galvanic bath is a sense of

#### ITCHING,

felt chiefly in the lower extremities and about the neck, and proportioned to the intensity of the current. Rather pleasant when mild or medium currents are used, under the influence of strong currents it may become so intense as to create an irresistible desire on the part of the bather to scratch especially the legs.

A negative effect of the galvanic bath, even where very intense currents are used, is the

#### ABSOLUTE FREEDOM FROM PAIN

throughout the entire process. I wish this to be

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\* Op. cit. pp. 253. et seq.

understood of course as holding good only when currents within the ordinary limits of intensity are employed. The strongest that I have used, and on which I base my statement, was that from 48 Stöhrer or 60 Hill cells. As stronger currents are not required for therapeutic purposes, what I have asserted remains practically true as applied within these limits.

This absence of pain, which cannot be claimed for correspondingly intense local applications, is to be attributed to the *diffusion* of the current throughout the body and its surface, as well as through the water of the bath. The redness of the *entire* back after a galvanic bath, is among the proofs of this diffusion.

Freedom from pain is a characteristic likewise of the faradic bath, *properly administered*. When too strong a faradic current however is incautiously administered, the resulting muscular contractions are accompanied by an amount of local pain proportioned to the violence of the contractions. By keeping the faradic current within proper limits, all pain can be avoided.

With respect to

#### MUSCULAR CONTRACTIONS,

the effects of the electric bath may be distinguished from those obtained by other modes of faradization



by their comprehensiveness. Many groups of muscles may be made simultaneously to contract by this means. The practical bearing of this on the therapeutics of *pareses* and *paralyses*, renders it an important characteristic of the bath.

The physiological effects on

#### THE MIND

of electric baths, is a natural result of the enhanced tone and vigor of the physical system, and keeps pace with this. Mental buoyancy and even exhilaration are among the most common sequences of electric baths. Although indirect, these results are none the less decided.

It has been my aim in the foregoing remarks to give the reader, as concisely as possible and within the limits which I set for myself in the beginning of the present chapter, a summary of the more important physiological effects of electric baths. As the isolated results of observations made in a limited field by one unaided individual, I trust the shortcomings of this chapter will be viewed indulgently. If what I have said of the physiological effects of electric baths proves the means of stimulating to further investigation more competent observers than myself, my labor, whatever its imperfections, will not have been in vain.



## CHAPTER IV.

### GENERAL THERAPEUTIC EFFECTS AND USES.

THE therapeutic uses of a remedy are based on what we know of its physiological effects. Many—or rather most—of the therapeutic effects of this as well as of most other remedies, correspond to certain physiological effects. Those therapeutic effects whereto we find none analogous among the physiological effects, are yet the results of the physiological tendencies of the remedy, and where these tendencies do not manifest themselves as results, it is because they find no field for action in the healthy organism. When they meet with the requisite pathological conditions, these tendencies make themselves manifest in the shape of definite results, commonly known as therapeutic effects.

NOTHNAGEL, in his classical work,\* recognizes this theory by excluding from his book the term “therapeutic effects” altogether. Where he finds it neces-

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\* Dr. Hermann Nothnagel : *Handbuch der Arzneimittellehre*. Berlin, 1870.

sary to say anything of the physiological effects of a remedy, in addition to those "on man in health," he speaks—still under the head of "physiological effects"—of those "on man when sick." When, setting aside its empirical employment, we come then to inquire what it is that furnishes us with the true indications for the use of a remedy, analysis of the question leads us invariably back to its physiological effects. If I have failed nevertheless to include the few effects which I am about to touch on, under the head of "physiological effects," I have done so simply in compliance with universal usage, and as a matter of convenience for reference.

I will now, without further digression, proceed to the consideration of those effects of electric baths not yet enumerated.

As a fitting precursor to the enumeration of the therapeutic properties of the remedy under consideration, it may be well to dwell for a moment on what is among its most prominent characteristics; I have reference to its great value as a

#### DIAGNOSTIC.

In explanation of this, I will state that in a very large number of cases of disease of an obscure nature, and where, to be candid, the electric bath was em-

ployed empirically, or, if you please, tentatively, it has served to point out the *locus morbi*. The number of cases in which I have made this observation, has been sufficiently large to establish beyond a doubt the fact, that as a rule the electric current makes itself more decidedly and often even painfully felt in any part where a morbid condition exists; whether this be of an inflammatory, neuralgic, rheumatic, traumatic, congestive or other nature, the result is the same. It appears to be somewhat analogous to the "tenderness on pressure" that we find present in many of these conditions. In *anæsthesiæ* even the current makes itself conspicuous by the *absence* of its normal effects. The value of this will at once be recognized in connection with a method of electric application which at one and the same time acts on every portion of the body. Local electrization is accompanied by like phenomena, *when we happen to strike the right spot*. The superiority of the bath as a means of diagnosis is found in the circumstance that here we *must* touch it.

The great importance of this feature of the electric bath will at once be realized by every physician of much experience, for there can be none such who has not frequently met with subacute or

chronic conditions the etiology of which was more or less obscure.

One of the most important effects in its therapeutic application of the electric bath, is its superior excellency as an

EQUALIZER OF THE CIRCULATION;

so far as I know, it is more potent, constant and comprehensive in this respect than any other agent. Where an imperfect circulation of the blood is due to irremovable organic causes, the results obtained will of course be transient only. In all other cases, however, favorable results, more or less perfect according to the nature of the case, may be reliably looked for. Both currents act very well in this respect, though on the whole I look upon the galvanic as superior to the faradic current.

As a theory of this effect of the currents I would offer the following, viz: That the galvanic current acts by stimulating the vasomotor centres and peripheral nerves, by giving tone to the muscular coats of blood vessels, and by counter-irritation. That the *faradic* current stimulates the vasomotor centres little, if at all, does not influence the coats of vessels, except such as are close to the skin, but tonicizes these latter more effectually than the gal-

vanic current; that it stimulates the peripheral nerves to some extent, though far inferior in this respect to the galvanic current; but that when employed of sufficient intensity it superadds to those mentioned a strictly mechanical action, which consists in forcing static blood from the capillary into the general circulation through the medium of muscular contractions.

As a

#### GENERAL COUNTER IRRITANT

the *galvanic* bath has few if any superiors. The degree of counter-irritation can be very nicely determined by regulating the intensity of the current. The characteristic tingling sensation of the galvanic current is felt over the entire surface, corresponding in degree of course to the intensity of the current; while the redness of the skin, bearing a like relation to the intensity of the current, is observable more especially near the electrodes, being particularly conspicuous over the entire back. Concentrated local counter-irritation can be obtained by the use of the surface-board.

The counter-irritant effects of the galvanic bath, differ from those of ordinary counter-irritants in their freedom from pain, even the slight burning

sensation accompanying strong currents ceasing with the application. The redness remains quite a while and the stimulus to the peripheral circulation causes the persistence for some time of a "glowing" sensation all over the body.

In the chapter on physiological effects enough has been stated to make it apparent that as a

#### GENERAL INVIGORANT AND TONIC

the electric bath can have few if any superiors. In the healthy organism, however, the stimulant and tonic effects of the baths are much less marked than they are where the general condition is "below par." In health there is little or no margin for improvement. The results obtained are *temporary* stimulation, and a permanent invigoration which partakes more of artificial development than anything else. It is analogous to the development by gymnastic or other exercise of a previously healthy set of muscles. Where we meet with atonic conditions however, with debility, malnutrition, want of energy or general asthenia of an obscure nature, and amenable to electric influence, the tonic effects of the baths become striking and brilliant. I have observed cases where patients fairly bloomed up under their influence and acquired actually more physical strength and

weighed more than before they became sick. When we consider how in such conditions as those mentioned, patients are made to swallow pills and mixtures for months or years, or, more appropriately, and if they can afford it, are sent abroad, we can realize the importance of an agent by means of which the desired end can be obtained more conveniently, certainly, economically and in a shorter time than by any other means. There is no rule without its exceptions, and I freely admit that in many instances where persons are, as the saying is, "run down," a sojourn in some mountainous region or a course of sea-bathing, etc., would do them more good than anything else, electric baths included. The results obtained from these last are however sufficiently uniform to justify us in looking for very favorable results in every case.

In the preceding chapter I have already dwelt on the

#### HYPNOTIC AND SEDATIVE INFLUENCE

of the baths. It is only necessary to state here that this influence manifests itself still more decidedly in corresponding morbid conditions than in health. The greater the degree of restlessness, irritability or wakefulness, the more strikingly does the soothing

and hypnotic influence of the baths—appropriately administered, of course—became apparent.

IMPROVEMENT OF NUTRITION,

as manifested by rapid increase of weight, and which I have likewise touched upon in the preceding chapter, is a reliable, constant effect of electric baths. Where previous loss of weight is due to an incurable organic disease, it is, if at all obtained, of course much less in degree, as well as transient. When due, however, as is frequently the case, to causes that are amenable to electrical influence, the increase in weight is marked, and has a tendency to be permanent.

It will be seen that the few therapeutic effects which I have here enumerated, are in reality nothing more than intensified physiological effects, there being about them nothing that might be termed specific. It may be asked in reply: why then did I devote any space to them at all? I will answer that I thought best to point out some general therapeutic USES for which electric baths may be made available, and the indications for which are furnished by so great a number of pathological conditions, that omitting special reference to them would have led to a great deal of tautology in the chapter on "special therapeutics."



Before leaving the subject of "general uses" of the baths, I will dwell for a moment on their admirable adaptability as a

PROPHYLACTIC.

Every physician is fully aware of the fact that disturbances of the circulation constitute one of the most frequent causes of disease. There are, indeed, comparatively few pathological conditions that do not bring with them congestion of some more or less important organ. A remedy then which more than any other has a tendency to equalize the circulation, and thus counteract a condition which as cause or effect, or both, is an almost universal concomitant of disease, and which in addition to this is so admirable and physiological a stimulant and tonic, can hardly be surpassed as a prophylactic by any other uncombined remedy.

## CHAPTER V.

### • SPECIAL THERAPEUTICS AND CLINICAL RECORD.

I HAVE thought it best for practical purposes, to accompany the consideration of the treatment of special diseases by the histories of illustrative cases, where I had such at command.

Before entering on the subject proper, I wish to offer some general considerations that may influence and guide us in determining when, where and why to employ electric baths as a remedy.

To realize thoroughly the indications in given cases for the employment of electric baths, we must first of all be more or less familiar with the effects and uses of the electric current as well as those of the ordinary warm bath. We must realize the fact that here we not only have these two forces united, but that the more important of the two, the electric current, here acts directly (locally) as well as indirectly (through the nervous centres) on every portion of the body—a circumstance of great importance in differentiating indications on the one hand

for the baths, on the other for local electrization. In view of these circumstances we are fully justified in looking for results far more comprehensive than any that might be obtained singly from either of the two remedies that are here combined. There can be no doubt that in many cases the resisting power of a disease is sufficient to withstand two remedies brought singly and alternately to combat it, whereas the simultaneous combined action of these remedies may be fully adequate to overcome this resisting power.

Approaching in its effects more closely to the electric bath than any other remedy, is the process known as "general faradization," to which I have already alluded (p. 36). In choosing between this and the bath, I state it as my conviction that, while there may be a small proportion of cases in which general faradization, so-called, is preferable, in almost all the cases where both these remedies are applicable, the faradic bath deserves the preference—it is a *more complete* faradization.

We need never be afraid of ordering electric baths on the score of any imagined exertion or discomfort attaching to them. The most delicate, the aged and children alike, bear them with far more ease, comfort and impunity than any ordinary warm

bath, or any but the mildest local electrization. The entire absence of shock or pain of any kind whatsoever, is always an agreeable surprise to those who, urged by their physicians, have with fear and trembling submitted themselves to a treatment, the mere name of which filled their minds with extravagant—and, it is useless to say, groundless—visions of painful shocks. Thanks to the tonic effects of the current, they are by the feeble and infirm borne much better than the ordinary warm bath. There is likewise much less liability to get cold after the electric bath. The stimulus which the current furnishes to the peripheral circulation is a powerful protection against cold, so that even in midwinter I see people daily take electric baths at an average temperature of 95°, and enjoy apparent immunity from colds.

Having once determined on the use of the baths in a given case, we have to observe certain points in their application.

In the first place, guided by what we know of the relative effects of galvanism and induced electricity, we must decide which of these two currents to use, and if both, in which order. We must determine on the direction and intensity of the currents, as well as on the duration of the baths.

Next we must use our judgment as physicians,

in deciding whether a given case promises to get well under electro-balneological treatment alone, or whether auxiliary treatment may not be required to bring it to a favorable issue.

With respect to the frequency of the applications, I will say that while there are some cases where a bath twice a week is sufficient, and others where a bath every day is imperatively necessary, in far the greater majority of cases suitable for electro-balneological treatment, a bath every alternate day is *sufficient*, but a bath every day is *better*—it leads to more rapid as well as certain results.

In most of the cases, a daily bath for a few days or a week, followed by one every other day for a time, and, when the cure is about completed, a bath twice a week, to *consolidate* and *confirm* the good results obtained, has done me the best service.

I would dwell particularly on the necessity of *perseverance* in this treatment. The majority of cases that have come under my observation in this connection, have been of a more or less chronic nature. In many of these, where medicinal and other treatment had been unavailingly gone through with for weeks, months and even years, I have found existing the most absurd expectations with regard to the effects of the baths. People who had made the

tour of almost all the watering-places of Europe without obtaining the slightest benefit, have come to me imbued with the idea—whence derived I know not—that one or two baths should greatly improve, and two or three more cure them; and when these expectations were not realized, they would promptly discontinue treatment, fully satisfied that electric baths were no more capable of benefiting them than “all the other things.” I do not mean to be understood for a moment as intending to imply that ideas of this nature are shared by the profession; I mention them simply in order to show the necessity on the part of physicians to disabuse in this respect the minds of those patients whom they may send for electro-balneological treatment.

In appropriate cases, the use of the bath should not be too long deferred. I have had frequent occasion to become cognizant of the fact, that cases have been sent by physicians to take the baths only after prolonged ineffectual treatment of another nature had been gone through with, and where negative or at best tardy results took the place of the brilliant results that might have been obtained, had the cases been sent earlier. I do not mention this in a fault-finding spirit; to do so would be unjust.

The remedy under consideration has up to the present time been too little known, the indications for its employment—in the absence of statistics—on too uncertain a basis, to expect from any but specialists the early realization in any case of its appropriateness. I trust however that in the future, from being a “dernier ressort,” it will come to take its proper place among other remedies, to be administered “when it will do the most good.” When this comes to pass, the results obtained, satisfactory as they are even now, will become as brilliant and well-authenticated as those of every other remedy from which experience has taught us how to reap the greatest advantage.

In the following “clinical record” I shall not omit to cite cases where the baths were unsuccessful, wherever it shall appear to me that the citation of such cases may be of assistance in arriving at a true estimation of the therapeutic value of the remedy.

In giving the histories of cases, it will scarcely be necessary to enter very minutely into details; the demands of the present work will be fully met if sufficient is said of a case to illustrate the effects of the baths in the class of cases that it represents.

Finally, I wish it understood that in a few of the

conditions in which I shall advise the employment of the baths, I have had no personal experience in their use, but base my opinions on what I know of their effects, together with what is known of the results obtained in analogous conditions by local electrical methods.

## SPECIAL DISEASES.

### RHEUMATISM.

Its great frequency, the pain and discomfort which it occasions, and its many, often dangerous *sequelæ*, added to its frequent obstinacy under the most varied treatment, render rheumatism one of the most formidable diseases that we have to encounter. The long list of remedies that have from time to time been employed in its treatment, bear witness by their very number to the little reliance that can be placed in any one of them. A remedy then which can be *relied on* to exercise a favorable influence in all the forms of rheumatism—acute, sub-acute and chronic—as well as on most of its *sequelæ*, should of right become a welcome addition to our armamentarium in the treatment of this disease; and such is the electric bath. The treatment of the *sequelæ* I shall speak of under separate heads. The disease



itself I will divide into three classes, viz: *a*) acute, *b*) subacute and *c*) chronic rheumatism.

*a*) ACUTE RHEUMATISM.—A few years ago the use of electricity in acute inflammatory conditions was scouted by most of the profession, and had it not been for the quiet and patient labors of a few progressive spirits, we would at the present day be still deprived of the benefits which we reap from it in these conditions. Even to-day, the number of those who are satisfied of the utility of electricity in this respect is comparatively small. Only two years ago, I attended a gentleman who was suffering from a very severe attack of rheumatic gout. I had both a galvanic and a faradic battery at his house, which, in addition to appropriate medicinal treatment, I applied daily to the affected joints,—using mainly the faradic current. Being compelled at the time to go to the country, the case during my absence drifted into the hands of a gentleman, a professor at one of the medical colleges, of high standing in the profession and considered one of our leading medical men, who ridiculed and promptly discontinued the use of electricity in the case. He gave it as his opinion that it did more harm than good, and I have no doubt he did so conscientiously—however unprofessional his conduct may have been, in this as well as

other respects. The contributions of others have since then vindicated my views in this respect. Among others, Dr. Drosdoff\* of St. Petersburg has given a number of cases of acute articular rheumatism from the clinique of Professor Botkin, in which the faradic current was employed either alone or in conjunction with other treatment. From among the deductions which he makes from a series of careful experiments in this respect, I quote a few—such as bear directly on our subject, and to which I affix my own numbers.

1) "The sense of pain as the result of electric irritation is considerably diminished, and sometimes entirely lost, in joints attacked by acute articular rheumatism, so that the patient experiences no pain, even when the distance between the coils equals naught†, and both closure and opening are accompanied by the evolution of numerous sparks. At the same time the slightest pressure of the affected parts gives rise to the most intense pain."

"The diminution of the electro-sensibility appears in the majority of cases to be in inverse proportion to the severity of the disease and the intensity of the pain produced by mechanical irritation."

2) "The enhanced tactile and thermic sensibility of the dis-

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\* Centralblatt für die medicinischen Wissenschaften, No. 17, 1875.

† The apparatus used in these experiments was that of Du Bois-Reymond, with a Grove's element.

eased joints is diminished by a faradization lasting from 5 to 10 minutes."

3) "From 5 to 10 minutes faradization causes a reduction of the previously heightened temperature of the diseased joints to the normal standard, or even below this."

4) "The subjective rheumatic pains which are augmented by pressure and motion, are diminished by faradization. This diminution is sometimes so considerable, that the joint, which prior to the faradization admitted of no movement, is able to execute passive and active movements with tolerable facility."

5) "The rheumatic pains as well as the temperature of the affected joints remain diminished after the faradization for 3, 4 and even 5 hours; they then gradually return to the previous height. At the same time the duration of the paroxysms of pain becomes shortened, and the intensity of this diminished."

6) "Although the rheumatic process takes a more rapid course under the influence of faradization, and incommodes the patient less, we have nevertheless made the observation in one case, that the tendency to recurrence is not diminished. The attacks however become more brief and milder."

7) "From what has here been said it follows, that daily faradizations, lasting 5—10 minutes, diminish the severity of acute articular rheumatism, restore the perverted cutaneous sensibility, and cause a reduction of the temperature of the affected joints."

8) "Several of those suffering from the pathological processes mentioned, received no medication in addition to the faradization, and yet made a tolerably rapid recovery."

I might adduce further testimony of the value

of electricity in recent cases of rheumatism, were it necessary to do so. The results in my own cases however have long since satisfied me of the utility in this respect of faradic not only, but also of mild constant currents. Accepting this as matter of fact, let us next inquire where and why we are to give *general* electrization—in other words, the electric bath—the preference over local applications.

Where the manifestations of the disease are limited to a single joint, or at best a very few joints, or where we have to do with a case of muscular rheumatism—to one group of muscles, local electrization, as *symptomatic* treatment, will answer. Where on the one hand however many joints, on the other the muscles of entire limbs, or even more, are involved, the advantages of a method by means of which we reach all the affected parts at once, thus effecting in, say ten minutes, that which where, for example, six joints are involved, would by the ordinary method require sixty minutes, are readily realized. There is, however, another reason why the baths are preferable in rheumatism to local applications. Rheumatism is a constitutional disease with local manifestations. The metastatic character of muscular rheumatism especially appears to indicate the greater importance of general as compared to local

treatment. Pre-supposing, then, that electricity exercises the favorable influence on rheumatism which clinical results would appear to demonstrate, it follows that the electric bath, while it furnishes symptomatic (local) treatment equally well with local applications, does something more; it meets the *indicatio morbi* likewise. The warm bath no doubt contributes its due share in bringing about the favorable results obtained.—Where the disease then does not confine the patient to bed, the electric bath will be found a most valuable remedy.

The following directions will be found to answer best in the great majority of cases: The temperature of the water should range from 90° to 98° F; a mild constant current, descending, should be applied for ten minutes; this to be followed by a faradic current of as great an intensity as the patient can bear *without the slightest degree of discomfort*. In the application of the faradic current, the surface board (see p. 12) may advantageously be had recourse to for the purpose of more concentrated influence on affected parts, to each of which it may be applied for a few minutes; the entire faradization may last from ten to fifteen minutes. When coming from the bath, the patient should be received in a warm blanket, anything like a chill being carefully guarded against. In cases

where the cutaneous secretion is of an abnormally acid character (which is often so marked as to become apparent through the sense of smell), bi-carbonate of soda or potassa may be added to the bath. As appears from the foregoing, the entire duration of the bath is from twenty to twenty-five minutes. The baths should be taken daily until all urgent symptoms have disappeared ; after this, every two or three days as required, until an entire cure is wrought.

As the results of this or similar treatment, conjoined with the requisite medicinal or other measures, I may state :

*a*) Considerable abridgment of the period of the disease ;

*b*) Sequelæ are less constant ;

*c*) The tendency to recurrence is very much diminished ;

*d*) A relapse, if it does occur, is comparatively mild.

With regard to *b* and *c*, let it be understood that I speak within the restrictions of a period of observation extending over two and a half years only.

#### *b*) SUBACUTE RHEUMATISM.

In the subacute variety, the electro-balneological treatment is similar to that in acute cases, with the

difference however, that here not so much care is necessary with regard to the intensity of the currents. Muscular contractions, as induced by strong faradic currents, are to be dreaded in direct proportion to the acuteness of the inflammation, *resp.* the sensitiveness of the inflamed tissues.

It will be understood, I hope, that the electrobalneological treatment as laid down above, though it applies to the majority, does not apply to all cases. Special complications may make it expedient in individual cases to modify the treatment more or less. The course to be pursued in these instances may however be safely left to the judgment of the attending physician.

c) CHRONIC RHEUMATISM. In this affection the course to be pursued varies from that indicated in the acute and subacute varieties. We have here little or no constitutional disturbance, and need have no fear of doing any harm by strong currents. On the contrary, I have found that mild currents rarely do any good. By far the greater majority of the cases that have come under my observation were of the muscular type, the algic portion of the symptoms approaching those of neuralgia rather than subacute rheumatism. Of chronic articular rheumatism I have treated but very few cases. Although in some of

the cases the treatment under consideration was attended with brilliant results, I freely admit that in some instances the results were imperfect, in others again entirely negative. This I found true more especially of cases that involved tendons. I must add, however, that in perhaps the greater majority of the unsuccessful cases the fault lay with the patients themselves, who, finding they were not benefited as rapidly as they had expected, discontinued treatment before this had had time to effect any thing.

In accordance with a theory which I have formed in regard to the pathology of chronic rheumatism, and which I am not yet prepared to promulgate (nor is it necessary here), I have of late been in the habit of administering in this disease, baths calculated to stimulate as much as possible the circulation of the blood. The best manner of applying the baths to this end will be found further on, under "*Inequalities of the Circulation.*" In addition to this I cause the galvanic (anode) as well as strong faradic currents to be applied to the affected parts by means of the surface board. Where there is any thickening, effusion or other similar concomitant of the disease, iodine may be added, as hereinbefore directed.



In chronic rheumatism it is not necessary to use the baths daily. Two or three times a week is quite sufficient. Indeed, the daily use of strong currents, as employed here, might in some instances be productive of evil rather than good. Although transient benefit may be experienced from a few baths—sometimes even from one bath, permanent progressive improvement need never be looked for from less than about a month's treatment—more or less, according to the nature etc. of the case.

I regret that I have no cases of acute rheumatism to offer. As a rule, a person suffering from this disease is not in a condition to leave the house; and in the cases that have occurred to me in private practice, the difficulty of introducing an electric bath at the patient's residence has been in every instance sufficiently great to induce me to forego this plan of treatment. While I have thus had frequent occasion here to employ local electrization, I have had but one case of acute rheumatism where I had the opportunity to employ the baths. The local symptoms in this case being limited to one arm and shoulder, the patient was enabled to locomote, and thus became an office-patient. At present the case is still under treatment; and although the results thus far have been eminently satisfactory, it

would yet be premature to cite it before I shall be able to state the final result.\*

CASE I.†—SUBACUTE RHEUMATISM. Mr. F., from the *clientele* of Dr. Alexander Murray, about 32 years of age, of robust appearance, large, vigorous frame, had an attack of acute inflammatory rheumatism in the spring of 1873, from which he recovered in a short time. In the winter of 1874 he experienced a second attack, for which he had had treatment for about two months prior to coming under Dr. M.'s care. After treating him by other methods, including local galvanic applications to the affected parts (joints as well as muscles were involved) for two weeks, Dr. M. sent patient to take electric baths. On May 25th Mr. F. was brought in a carriage. He was unable to walk; had to be assisted up the steps by two attendants. His arms were in a scarcely better condition, the wrist joints especially being exceedingly tender and painful. The first and second baths, administered respectively on May 25th and 29th, did not effect much change in his condition. The third bath was taken May 30th, with the happiest results. On June 1st patient was able to come for his fourth bath alone and on foot, and thenceforth his recovery was very rapid. The seventh bath, taken June 7th, left him perfectly cured, not a trace of the disease remaining. He has been free from rheumatism since. In the first three baths the galvanic current was employed exclusively, the muscles and tendons being in too

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\* Since writing the above, this case has had an entirely favorable termination.

† The cases distinguished by an asterisk were published in No. 216 of the "Medical Record."

## CHOREA.

The utility in this disease of electricity has been for some time past almost universally conceded. While some vaunt the faradic, others prefer the galvanic current in its treatment. It appears that thus far the best results have been obtained on the one hand by galvanization of the spine, on the other by general faradization. It occurred to me, when I began to devote myself to electro-balneological treatment, that a method which combines the electrical procedures alluded to, must needs also combine their virtues. Accordingly, I discontinued my previous practice of spinal galvanization in this disease, and had recourse to the baths in almost every case that applied to me for treatment. I am happy to state that in no instance where the baths were employed was anything short of a perfect result obtained. I will state on the other hand, that in every case medicinal treatment was had recourse to at the same time. It is equally true however, that in all the cases medicinal treatment *without* the baths had proved of no avail. The best method of employing the bath is as follows: For the first ten minutes a constant current of medium intensity should be passed, one pole communicating with the

head-electrode, the other connected with the surface board, applied for five minutes to the epigastrium, five minutes to the sacral region. In anæmic persons the current should be descending, in all others, ascending. This concluded, a strong general \* faradic current should be employed for five minutes. By this means all the muscles of the lower extremities will be very thoroughly contracted. The pole of the battery attached to the foot-electrode should now be transferred to the surface board, and the hands of the patient made to hold this, under water, an additional five minutes. In routine cases this method of administering the baths will be found very efficient. In special cases it may be modified as expedient in the judgment of the practitioner.

CASE VI.\* Hugh O—l, aet. 12 years, from the *clientele* of Dr. J. O. FARRINGTON, came for treatment February 5th, 1874. This was one of the most severe and obstinate cases of chorea that I have ever met with. Internal medication, ether spray, change of air etc. had been of no avail. Between the date above mentioned and March 23d the boy had seventeen baths, steadily improving. He made a complete and (thus far) permanent

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\* Wherever I use the word "general" as descriptive of an electric current used in the bath, it is not as a characteristic, but merely to distinguish it from the instances where the surface board is employed.

recovery. His intellect, which had been somewhat impaired, was considerably improved.

CASE VII. J. G., aet. 9 years, was sent for electrical treatment on September 22d, 1874, by Dr. KREHBIEL. He had been under medicinal treatment for a long time, the choreic manifestations dating back upwards of a year. When I first saw him, the choreic movements were so continuous and violent as to preclude the possibility of administering electric baths. The attempt was indeed made; but no sooner had we managed to place the boy in the tub, than he splashed the water freely about, and by the violence of his movements bid fair to injure himself. I therefore deferred for a time the electro-balneological treatment, and had course to ordinary spinal galvanizations. These, together with internal medication—which Dr. K. attended to—had by the 8th of October diminished sufficiently the violence of the movements to admit of the administration of the baths. Accordingly the local applications were discontinued, and from Oct. 8th to Nov. 27th the boy had seventeen baths, when, all traces of the disease having disappeared, treatment was discontinued.

#### HYSTERICAL AFFECTIONS.

If there is any one disease that more frequently than any other tempts the physician to have recourse to empirical treatment, it surely is hysteria. The obscurity, in many cases, of its etiology, as well as its frequent obstinacy under the most diverse methods of treatment, successively employed, are alone sufficient to warrant us in having recourse to

electricity, where this has not already been employed. Where we can establish the etiology of a given case, we cannot of course be in doubt as to the remedy; and in many instances of this kind we find in electricity our most potent curative agent. But even where we are in doubt or positively ignorant as to the origin of the symptoms, we are justified in giving preference empirically to electricity, not only because, the disease being essentially of a nervous character, we find in electricity the most powerful of neurotics, but also because *recent* statistics, those that embrace a period when electricity has been permitted to participate, if not duly, at least more largely than heretofore, in the treatment of disease, go to show that by means of this remedy better average results have been obtained than with any other. Again, where there are no positive indications to employ any special method of electrization, either central or local, it appears rational to give the preference to a method that is at the same time central and peripheral, that admits of the application of either current with the utmost facility, and is susceptible of so many modifications that, with at best two or three tentative applications, it can be suitably adapted to almost any given case. The results I have thus far obtained justify me in assert-

ing that, of the cases that are merely functional in their nature, by far the greater majority will yield completely to judicious electro-balneological treatment.

As to the mode of administration in this affection, I can suggest nothing. There is so little uniformity in the manifestations of hysteria, that it were idle to even attempt to establish anything like a routine electro-balneological treatment. Each case must make its own laws.

CASE VIII.\* Mrs. A., aet. 28, married, sterile, from the *clientele* of Dr. KREMER, was referred to me on June 12th, 1874. She had been a sufferer from hysteria for a number of years. Among the more prominent symptoms were intense *pruritus*, transient flushing and heat of the entire surface, with pricking sensations and headache. Six baths, in each of which both currents were employed, sufficed to effect a complete and permanent cure.

CASE IX.\* Mrs. E., from the *clientele* of Dr. KREHBIEL, aet. 28, married, of an exceedingly nervous temperament, had suffered from excessive nervous irritability and prostration since her last confinement (about a year previous to my seeing her). There was no organic trouble, the symptoms pointing to pure functional hysteria. She was sent for electro-balneological treatment April 21st, 1874. Six baths, in which both currents were employed, restored her to perfect health.

## NEURASTHENIA.

## (NERVOUS EXHAUSTION.)

Those who are familiar with the pre-eminent qualities as a neurotic of electricity, will not be surprised to be told of the beneficial effects in the condition under consideration of electric baths. It is not only in *general* nervous exhaustion, however, that electric baths exercise this salutary influence, but in the condition known as *cerebral exhaustion* likewise. Judging from my own experience, their efficacy in this latter condition is far greater than that of local applications, whilst they are unattended with any of the irritant and other disagreeable effects that even with the greatest care and caution we cannot always disassociate from galvanization of the brain. They no doubt act here in two ways, i. e., first and chiefly, through reflex influence from the entire periphery; second, by derived currents on the brain directly. Whatever their mode of action, the results obtained are of the most gratifying kind. The pitiable condition in which some patients of this class present themselves, is familiar enough to every physician; but it appears that the greater the degree of exhaustion and the more prostrate the various functions,



the more striking are the effects of the baths. The patients seem to live up anew under their influence. While in many if not most other complaints that come under electro-balneological treatment, a certain number of baths are requisite in order to get discernible effects, in the disease under consideration each bath, except perhaps the first, is followed by more or less immediate improvement, which, if the treatment is persevered in, remains permanent.

It is almost unnecessary to say, that in the more advanced cases great care is requisite in the administration of the baths. By over-stimulation at first, much harm may be done, and the patient, instead of getting better, get worse. In such cases very mild currents should be employed in the beginning. As recuperation advances, stronger currents may be gradually introduced. The intensity of the currents should be carefully regulated to keep pace with the gradually increasing capacity of the various organs to respond to the electric stimulus without detriment. Both currents may be used from the first. The galvanic current should precede the faradic, and be employed for not more than ten minutes. Where irritability is a feature of the case, the current should be descending; otherwise ascending. This may be followed by the faradic current, not of sufficient in-

tensity for the first few baths, however, to cause any but *slight* muscular contractions. In most of these cases iron may be advantageously added to the bath. The duration of the baths should at first not exceed fifteen minutes; in some cases this even is too long, the patient complaining of being fatigued perhaps after the lapse of ten minutes. When this is the case, the bath should be at once terminated. It is in these instances not the electric current, but the warm water bath, that gives rise to the sense of fatigue. Later on in the treatment, the duration of the baths may be from twenty to twenty five minutes, according to indications.

CASE X. *Cerebral Exhaustion*.—K. S., aet. 42, lawyer. First consulted me on June 2d, 1874. The salient points in the history of this most interesting case are as follows: Ten years prior to his calling on me he was engaged in some very heavy law cases and other duties requiring intense mental application. At that time he began to manifest occasional symptoms of cerebral exhaustion; was unable to endure mental exertion with same force as theretofore. These attacks, commencing in 1864, supervened at various times until 1868, sometimes incapacitating him for business for a few days at a time, and accompanied by intestinal catarrh, flatulence and gastric disturbances—probably the results of loss of nerve-power. In 1868, having been subject for a time to extra heavy mental strain, he was completely prostrated, and compelled to retire from the pursuit of his

profession. By the advice of his physician he went to the country. There, without any premonitory symptom whatsoever, he suffered an attack of (left) hemiplegia. I quote from his recital as follows: "While standing in the office of the hotel registering my name in the book, I suddenly dropped down, retaining full consciousness. I lost the power of speech for some hours. After twenty-four hours the paralysis began to recede, and in a few days I had made a spontaneous recovery. I then went further into the interior. Two weeks subsequently I had a similar, but milder attack; retained full consciousness and mental control. Returned to city (New York) two weeks after this, in a very debilitated condition. On the third day after my return, I had a more violent attack than either of the preceding—again on the left side. I felt as if a line were drawn perpendicularly through my body, dividing it in halves. My stools were clay-colored. With this attack for the first time I became unconscious, and passed into a delirious state. So far as I know, no diagnosis of my condition was made. I was confined to bed for a month, at the end of which I was in a very feeble state. I then went to Europe, where I spent some years. While there I consulted the first physicians of London and Paris, with but little benefit, however. Both mind and body remained feeble. My normal weight is upwards of 120 pounds, but has for a long time past been in the neighborhood of 90 pounds."

When Mr. S. came to consult me, he had but lately returned from Europe, whence, he stated, his physicians had sent him home to die. His complexion was sallow, sickly; skin of face plentifully wrinkled; features wearing the air of suffering and anxiety that so frequently accompanies painful chronic conditions. He had for some time past suffered from excessive cere-

bro-spinal irritability, for the relief of which cantharidal collodion had been employed in the cervico-spinal region (the same had also been used in the hepatic region, to meet the diagnostic views of some one of his medical attendants). He had a remittent chronic intestinal catarrh, with—noticeably during the periods of exacerbation—abundant discharge of a glairy mucus. The appetite was very capricious—not to say poor, and he was obliged to be exceedingly careful in his diet. He was not capable of any continued mental application. The muscular system was weak and flabby. All the vegetative functions were more or less impaired.

On June 3d, 1874, Mr S., by my directions, took an electric bath. He continued the baths daily for some weeks; then every two or three days, all the time steadily improving. He had some adjuvant medicinal treatment, probably similar to what he had already had in Europe. He states, however, that his improvement commenced with the first bath he took; and the baths certainly constituted the main treatment throughout. He gained daily in every respect. Mind and body were invigorated; his muscles increased in size and hardness; color gradually returned to his cheeks, etc. He continued the baths with more or less regularity until the close of the year, taking in all sixty-one baths. He was then in a better condition than he had been for many years. Thinking a trip to Europe would benefit him, I advised him to go there and remain a few months. He left early in January and returned in the beginning of April, 1875. He had been very well during his absence, until within a few weeks prior to his departure from Europe, when he experienced a severe attack of cerebro-spinal congestion, which caused him much suffering. On his return he resumed the baths, and con-

tinued them throughout the spring, continually gaining in strength and weight. At the beginning of last summer he was practically well. He has regained his normal weight (120 pounds). As a criterion of his bodily vigor, I will simply state that I have seen him lift, with ease, 350 pounds, which, for a person of his weight, is not bad. His mental force is as good as it has ever been. The digestive disturbances have disappeared; he can eat things which for years he had been compelled to eschew. To use his own words: "I am well." In view of the fact that he had already received, at the hands of competent men, all sorts of internal as well as external treatment, I believe I am justified in attributing his cure almost entirely if not solely to the baths.

CASE XI. Mr. \* \* \*, aet. about 50, lawyer, of large, vigorous frame, came to consult me January 4th, 1875. He complained of symptoms that are the frequent results of prolonged mental over-taxation. His intellect was as good as ever, but he lacked his wonted mental endurance and power of application. His mind was perfectly clear, but unable to work. It was a case of "*limited cerebral exhaustion.*" Physical nutrition was pretty good; yet his color was not normal, being rather paler than it had been and has since become again. His flesh was flabby. There were vague neurotic disturbances, etc., etc. He had until recently occupied a leading public position, and the onerous duties that devolved on him in connection with this, evidently stood in direct etiological relation to his trouble. I ordered an electric bath every other day. This was complied with until the end of February, when the patient had apparently entirely recovered his health, mentally as well as physically. I saw him not very long ago; he looked the picture of health,

and told me that he was and had been since I saw him, perfectly well in every respect.

CASE XII. Mr. L., aet. 23, presented himself for treatment in October, 1874. He had at various times made the attempt to study some profession, but had never been able to concentrate his mind sufficiently on any object to enable him to persevere in its pursuit. He was fretful, irritable and vacillating; would desire one thing to-day, another to-morrow; never long of the same mind. Melancholia, digestive disturbances and hypochondriacal phenomena accompanied this condition. No organic disease was discoverable. On October 1st he took his first bath. Very shortly after this he commenced the study of medicine. He improved rapidly in every respect. During the month of October he had six baths, which resulted in complete and permanent relief of all the symptoms. He progressed satisfactorily in his studies, and is at the present time taking his second course in one of our city medical colleges.

### AGRYPNIA.

(INSOMNIA; SLEEPLESSNESS).

Although, as a rule, but the symptom of some definite pathological condition, agrypnia is of such frequent occurrence, and so detrimental to the general health, that it appears to me to merit special consideration. This holds good especially in this connection, because, even where electric baths fail to influence the disease giving rise to the insomnia, they almost invariably remove this, irrespective of its

cause. Even where, the disease itself remaining uncured, the insomnia must return sooner or later, the sleep is very much improved while the baths are being had recourse to. We must of course endeavor in all cases to relieve the original disease, and, where the baths are not adapted to this purpose, resort to other and appropriate means. It will be found of no small service to us in the therapeutical management of every case, to be enabled to procure for the patient, without the aid of medicinal hypnotics, sufficient of sleep during treatment.

CASE XIII. Mr. A., from the *clientele* of Dr. LEONARD WEBER, was sent by Dr. W. to take electric baths. He suffered from chronic spinal congestion. Among the most prominent and annoying symptoms was *agrypnia*. It was for the relief of this symptom chiefly that Dr. W. ordered him the baths. He began to improve in this respect from the time he took his first bath, and although the disease itself remained uncured, he enjoyed good sound sleep while he was under treatment, his general health improved, and he frequently spoke of the notable benefits that he received from the baths. He continued them until his departure for Europe, where, by direction of his physician, he went last spring. I have not seen him since, but Dr. W. tells me that he is doing well.

CASE XIV. Mr. D. was brought on Sept. 30th, 1874, by his physician, Dr. HOGAN. He was in the incipient stage of *delirium tremens*. Had not slept for some nights. Dr. H. had administered successively opiates, chloral and bromides in full

doses, without effect. On the evening of above date the patient had a bath, in which the descending galvanic current was used. As a result, he slept well that night. The baths were repeated on the two succeeding days, with like effect. As the disease developed however it became necessary to send the patient to an asylum, whence he returned cured in a short time. The effect of the baths in this case, where full doses of the most powerful hypnotics of the materia medica had failed, was remarkably illustrative of their hypnotic power.

#### ANÆMIA.

As is well known to the profession, anæmia forms the basis of a great number of morbid conditions. Hysteria, general debility, emaciation, sterility, various nervous affections, phthisis, in short, a perversion of almost any of the various physiological functions may be the direct result of anæmia. On the other hand, anæmia may be only a symptom or sequel of some other morbid condition—but of such cases I do not now speak. I have to do here only with those cases where anæmia is the primary and etiological of a group of symptoms, and where therefore it is to this that the treatment must be mainly directed. Now let us see what this treatment is. Dr. FLINT\* suggests the following therapeutic measures: “*first*, a nutritious alimentation, into which meat

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\* Austin Flint, M.D. A Treatise on the Principles and Practice of Medicine. Philadelphia, 1873. 4th ed. pp. 63 and 64.



should enter largely; *second*, the use of tonics and stimulants to render the digestive functions more active; *third*, iron as a special remedy—the effect of which is often remarkable; and, *fourth*, a regimen calculated to increase the energy of the assimilative functions, consisting of exercise in the open air, recreation, etc.” This agrees mainly with the views of other writers. It may conveniently be condensed under two heads, instead of four, namely: *first*, to secure for the patient appropriate food and adopt the best means to insure its assimilation; *second*, the administration of iron. As to the ingestion of appropriate food, open air exercise, etc., patients are of course to receive the necessary directions. The remainder of the therapeutic indications, as given above, are admirably met by electric baths. As we have seen in a preceding chapter (p. 43 et seq.), they are a tonic and stimulant of the first order, and as nearly as possible a specific for the furtherance of the digestive and assimilative processes. When impregnated with iron, they constitute a treatment for anæmia which, in conjunction with the requisite diet and other hygienic measures, is inferior to no other. It will moreover be found very efficacious in counteracting secondary anæmia, and thus, by maintaining the general strength of the patient, often enable nature and appropriate treatment to cope successfully with the original disease.

CASE XV. Mrs. S., aet. 22, four years married. I was called to see her on October 2d, 1874. She then had a spontaneous miscarriage, the fifth since her marriage. She asked me whether nothing could be done to enable her to carry a child to full term, as both she and her husband were very desirous to have offspring. In pursuance of my directions, she presented herself at my office about ten days after I first saw her. On examination I found no organic trouble, no uterine displacement, nor any other local trouble to account for her premature confinements. Involution had progressed normally. The only deviation from the normal that I could discover about the uterus was undue paleness of the cervical portion. Her appearance was very decidedly anæmic; features pale, flabby; lips whitish blue; physical energy much depressed. She had had but very slight loss of blood on the occasion of her recent miscarriage; certainly not enough to account for her anæmic appearance. Viewing her case as one of idiopathic anæmia, I ordered her electric baths strongly impregnated with iron. In addition to this, the regimen usual in such cases, and also strychnia and phosphorus internally. She took her first bath on Oct. 14th; then one bath weekly until she had taken six baths, the last of which was administered on the 24th of November. During all this time she kept steadily improving. The anæmic appearance and symptoms gradually receded, and, soon after she had taken her last bath, I discharged her, as far as the anæmia was concerned—cured. While she was under treatment she had, by my advice, refrained entirely from sexual intercourse. Early in the spring of 1875 she called to tell that she was again pregnant, and in November, 1875, I delivered her of a healthy male child, at full term.

## PARALYSES AND PARESES.

I include these under one head, because not only is their origin frequently identical, but, chiefly, because the therapeutic indications are almost always the same in both. Whatever the cause in any given case, whether cerebral, spinal or peripheral, organic or functional; whatever the treatment that may be indicated—and this should never be neglected—for the primary trouble, the direct electrical treatment of the paralysis, sub-paralysis or paresis, being purely *symptomatic* treatment, remains in the great majority of cases essentially the same. The objects to be aimed at are two, viz: *first*, a normal state of nutrition of the affected muscles; *second*, their normal contractility. In other words, we are to endeavor to prevent atrophy of the affected muscles, or, where this has already taken place to some extent, to restore their normal bulk; and, *second*, we must strive to restore the more or less impaired contractility of the paralytic or paretic muscles. Even where symptomatic treatment for these purposes is the *only* treatment employed in a case, we frequently meet to a great extent the *indication morbi*, by favorably influencing, either in a reflex or direct manner, the primary disease. This is true

of *local* electrizations of the affected parts; it holds good much more strongly however of *electric baths*, because here, in addition to the reflex influence that we get from local applications, we have also the direct influence of the electric current on the spinal cord and posterior portion of the brain not only, but on the sympathetic system and all the important organs contained in the thoracic and abdominal cavities. The great importance of this is apparent, when we reflect that in very many if not most cases of disease of the nervous system, central or peripheral, electricity in an appropriate form is a useful therapeutic agent, and that moreover the great majority of functional paralytic disorders respond favorably to its influence. As for any harm being done by it in those rare cases where its use may be contra-indicated, I admit that such may accrue from the administration of electric baths without medical supervision; it is entirely obviated however where the baths are under the supervision of a physician, who does not, like a layman, indiscriminately admit to their use any and everybody who is willing to pay for their administration, but will carefully discriminate, and conscientiously exclude those cases in which general electrization might result injuriously. In such cases a tolerably accurate diagnosis is as

a rule readily made, and will enable the physician to separate the suitable from the unsuitable cases.

As to the mode of administration of the baths in cases of the class under consideration, the use of both currents is requisite; the galvanic as a nutrient, the faradic as an excito-motor agent. Where, as is sometimes the case, faradic irritability is extinct, or so slight as to be practically unavailable, the (slowly) interrupted galvanic current must take the place of the faradic, until faradic irritability has become re-established. As to the intensity, direction, etc., of the currents, each individual case has its own laws, which must be recognized by the supervising physician.

CASE XVI.—*Infantile paralysis*. Albert Pichl, aet. 22 months, was sent me by Dr. LILIENTHAL, October 3d, 1874. Had complete paralysis of right leg (of four weeks standing), with considerable atrophy of the entire leg as well as the gluteal region of the corresponding side. The temperature of the leg was much lower than that of the healthy limb. *Faradic irritability was entirely extinct*. The treatment was begun by galvanizations of the lower (lumbar and sacral) portion of the spinal cord, and the use of the interrupted galvanic current on the affected muscles. This was at first done daily. The contractility of the muscles gradually but slowly improved, but neither the atrophy nor temperature of the limb appeared visibly affected by the treatment. With a view to favorably influ-

encing these conditions, I ordered him galvanic baths. He had a bath every alternate day. The result was favorable and rapid. The leg became sensibly and permanently warmer after each bath, and commenced steadily to increase in bulk. Faradic irritability soon returned. The local applications were continued several times a week for some time, and then gradually abandoned, the baths being meantime continued regularly. The boy very soon began to walk, and in December active treatment was discontinued. At that time, faradic irritability having long since become completely re-established, I caused the child's father to purchase a faradic battery to use at home. The limb was eventually entirely restored in every respect, with the exception of a slight abduction of the foot, for which I referred the patient to Dr. GIBNEY. I saw the child recently; he remains well.

CASE XVII.\* *Sub-hemiplegia from cerebral hemorrhage.* Mrs. S., aet. 30, married, from the practice of Dr. KREHBIEL, was sent by Dr. K. to take baths, July 3d, 1874. It was a routine case, differing in no respect from what is ordinarily witnessed as a sequence of cerebral hemorrhage. Six baths, taken at intervals of two and three days, restored almost entirely the muscular power of the affected side. The patient subsequently made a complete recovery without further treatment.

CASE XVIII. *Paralysis from insolation.* Mr. P., proof-reader aet. about 40, had suffered for some time from sub-paraplegia, the result of insolation. He was sent to take baths in May, 1874, by his physician, Dr. SCHIRMER. Electro-balneological treatment in this case met with no success.

CASE XIX. *Lead paralysis.* Mr. M., aet. about 35, painter, was referred to me for treatment May 15th, 1874, by Dr.

MOHN. The extensors of one (I believe it was the right) arm were paralyzed. The characteristic blue line about the gums was clearly defined. I ordered an electric bath daily. The descending galvanic current was used for twenty minutes each bath. From half to one ounce of iodide of potassium was added to each bath. The blue line became less distinct from day to day, until, after eleven baths, it had entirely disappeared. The object for which I had ordered the baths having now been accomplished, I treated the affected muscles with the faradic current. A short course of this treatment sufficed to remove the paralysis from all but one finger (it was either the middle or ring finger), the extensors of which had probably undergone fatty degeneration.

#### NEURALGIÆ.

The great variety of causes that may give rise to neuralgia, precludes the possibility of any specific for this symptom. In discussing its electro-balneological treatment, I would observe *a primo* that I cannot, in the light of my personal experience, agree with those who claim for electrical treatment good results in a *majority* of cases.\* On the other hand it cannot be denied that, either as a palliative or curative measure, electricity, employed in an appropriate form and manner, is of inestimable value in many cases, and frequently succeeds where all other remedies are of no avail. Where we know the cause of a neu-

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\* See Beard and Rockwell, op. cit., 2d ed. p. 472.

ralgia, it is of course comparatively easy for us to determine whether or not electricity promises to avail anything. But even where the nature of the cases appeared to indicate its use, the failures, in my hands at least, have outnumbered the successes. The brilliant results—sometimes almost instantaneous—that we obtain now and then, should not lead us into overlooking our failures. Undoubtedly the circumstance that most of the cases that have come under my observation were of a very obstinate nature, referred to me by other physicians after varied unsuccessful treatment, has much to do with the formation of my views as expressed above, and future experience may perhaps lead me to modify them.

Speaking still from my own experience, I will state that the cases that have proven the most amenable to treatment were, *first*, those of rheumatic origin ; *second*, hysterical neuralgiæ, and, *third*, cases where no assignable cause could be elicited. The most obstinate varieties were those of a malarial type (even when quinine in large doses or arsenic were employed in conjunction with galvanism) and those that depended on some form of chronic inflammation—*neuritis*, *periostitis*, etc. Of central neuralgiæ, I have had excellent results in the sympathetic variety and in the pains of posterior spinal sclerosis,



while in the neuralgiæ of cerebral origin (diffuse cerebral sclerosis, tumors, etc.) I have never met with any appreciable success.

Where, then, we are able accurately to diagnose a case, there cannot be much doubt as to the appropriateness or not of electrical treatment, and in case whose origin is obscure, which may be considered practically functional and therefore treated more or less empirically, electricity holds out as much more hope than any other remedy. Whether electricity should be employed locally or in the form of baths, must depend on the features presented in each individual case. In neuralgia of the fifth pair, excepting those reflex cases where the *point d'origine* is to be sought for somewhere in the trunk or extremities, and those that depend on cerebral hyperæmia or anæmia, where the equalizing effects of baths on the circulation are frequently of great benefit—these are generally useless. Of other neuralgias I have found the baths less successful in those of the superior than in those of the inferior spinal nerves. Lumbo-abdominal neuralgia and sciatica have yielded much more readily than brachial or dorso-intercostal neuralgia, etc., etc.

The mode of administering the baths in neuralgia does not possess enough of uniformity to

suggestion in this respect of any value. I will state however that, as a rule, the best results have been obtained from the descending galvanic current.

In chronic cases the baths should be administered daily, and should not be discarded as unavailing until at least a dozen have been successively taken.

CASE XX. *Sciatica*. Mr. R., a middle aged man, mechanic, was sent by Dr. ARCULARIUS Nov. 9th, 1874. Had post-rheumatic sciatica of some six weeks' standing. There were no remarkable features about the case, which however was sufficiently severe to disable him from pursuing his avocation. He took his first bath on the date above-mentioned. Another bath was administered next day, and three more every alternate day. He was then almost well. On Nov. 25th he returned, there remaining still some traces of the affection. Four more baths, the last of which was administered on Dec. 4th, sufficed to complete the cure.

CASE XXI. *Sciatica*. Mr. G., aet. about 35, saddler, was sent by Dr. WAECHTER, March 6th, 1875. Had suffered from sciatica without discoverable cause for several years. For one year prior to his visit had been unable to work, and was confined to bed a great portion of the time. There was slight atrophy of the affected limb. He had had considerable medical (including local electrical) treatment, without avail. The baths were faithfully and persistently tried in this case, effecting however but slight improvement. Subsequent hypodermic injections, first of strychnia, then of atropia and finally of chloroform, the latter in

doses ranging from 30 to 60 minims, gave him only temporary relief. The patient was finally discharged uncured.

CASE XXII. *Lumbo-abdominal neuralgia*. Mr. W., aet. about 40, was brought by Dr. MARVIN S. BUTTLES in June, 1875. He had been in poor health for a number of years, and was then in a very cachectic condition. There was considerable gluteal atrophy on the affected side. At Dr. B.'s suggestion he took a course of electric baths, with the happiest result. He improved steadily, and on the occasion of a late inquiry after I had not seen him for some months, Dr. B. told me that the patient had entirely recovered. His general condition as well as the neuralgia had been very favorably modified by the baths, and he is now in far better health than he has been for many years.

CASE XXIII.—*Lumbo-abdominal neuralgia*. Mr. G., aet. 40, came to consult me in October, 1875. He had suffered from neuralgic pains, more particularly in the renal region of both sides, but also in the neighboring parts, for only one week. The case being so recent, I entertained a very favorable prognosis, which subsequently was amply verified. A bath on the 12th of October and one on the 16th sufficed to effect a complete cure.

#### ARTICULAR EFFUSIONS.

It would appear at a first glance as though local galvanization of affected joints should be more directly and powerfully instrumental than electric baths in promoting the absorption of morbid deposits. To suppose so would however be a mistake—

even where a single joint is concerned. Where many joints are involved, the advantages over local galvanization of the baths is sufficiently obvious. Where but a single joint is involved, the current can by means of the surface board be concentrated on the affected joint, while by the general galvanization a stimulus is furnished to the absorbents, that in itself is probably fully as important as any local treatment could be. In this manner absorption is made to progress much more certainly and rapidly, and this course is therefore to be given the preference in all cases where no special contra-indication exists.

The ascending general galvanic current should be employed for from 5 to 10 minutes. The surface board, connected with the negative pole, should then be applied for a few minutes successively to each of the affected joints. Iodine in some form should be added to the baths.

CASE XXIV.\* *Specific synovitis of knee-joint, with considerable articular and peri-articular effusion.* Mr. C., from the practice of Dr. SHEPPARD, aet. about 35. First saw patient at his house on Nov. 9th, 1873, in consultation with Dr. S. and Dr. HUTCHINSON, of Providence, R. I. Had been on mercury and iodide of potassium for a long time. When I first saw him, he had been incapacitated from work for about a year. Had been unable to leave the house for three months. The affected

joint was very much enlarged, with little or no mobility, the condition being practically the same as true ankylosis. It was decided to substitute tonics for the specific treatment, and to administer galvanic baths. On Nov. 11th the first bath was administered, another on the 15th, and a third on the 19th. Considerable improvement in motility was then apparent. Two more baths, taken respectively on the 22d and 29th, effected some reduction in the size of the knee. The baths were continued to January 3d, 1874, when the effusion had become almost entirely absorbed, and the joint perfectly mobile. The patient then had been for some time taking daily walks, unassisted. He now (Jany. 3d) walks without any difficulty, has regained his normal vigor, and is perfectly well.

#### IMPOTENCY.

The frequent obstinacy of this distressing condition under every variety of non-electrical treatment, is the cause of the frequency with which cases present themselves to the specialist. Unfortunately however but few of the referred cases are of recent origin. In almost all instances they have gone through a vast amount of medication and other treatment, and finally, either through their attending physicians or of their own accord, they come as a *dernier ressort* to seek relief from electrical treatment. I have already (p. 47) spoken of the comparative merits in this disease of local and general electrization. A few years ago I was ignorant of the

good effects of the baths in male impotency. I came to test and employ them here from two causes. In the first place, patients were sent me specially for electro-balneological treatment, ordered by their physicians: and, second, I began, when I became familiarized with the effects of the baths, to have recourse to them in cases where with local electrical and other treatment I had been unable to accomplish anything. My average results, without becoming uniformly successful, became so very much better, that after a brief but abundant experience with this treatment, I have come to consider it the most important we possess in this affection; one that will frequently succeed when everything else, including local electrization, has failed, and which, in cases where no incurable organic changes underlie the affection, will, if properly persisted in, either cure or improve to a great extent a large majority of the cases. I have even seen instances where, the sexual power having receded as the legitimate result of advancing age, it returned almost or quite perfectly and with seeming permanency under the influence of the baths. In the class of cases—and they are quite numerous—in which impotency (loss of the power of erection) occurs as a purely nervous symptom in comparatively young men; where its cause is sometimes purely

imaginative, at others the result of early excesses, the baths are attended with the most gratifying average results. Where the cause is purely psychical, a very few baths are sometimes sufficient to dispel the morbid phenomena. Where masturbation or excessive venery are at the bottom of the trouble, there is always a probability of more or less organic change in the lower portion of the spinal cord, and frequently also a secondary enfeeblement of the digestive functions, which render requisite a long and steadily continued use of the baths. Patients whose sexual power was intact, who took the baths for other purposes, have time and again called my attention to their aphrodisiac effects.

While here the *general* electric influence is the main remedial agency, there is no reason why the possible—or, I should say, probable—good to be obtained from its *local* influence should not be realized—the less so that it is so facile to obtain this in the bath, by means of the surface board. While individual cases will undoubtedly call for modifications, I have found the following plan to answer best in certainly more than half the cases that have come under my observation: The first five minutes of the bath may be occupied by a general galvanic current of medium intensity, *descending* where the patient is of an irri-

table, *ascending* where of a phlegmatic temperament. The pole connected with the foot electrode should now be detached, and the surface board substituted. The second five or ten minutes may be consumed by running a galvanic current between the head electrode and the surface board, the latter applied alternately to the penis, scrotum, perineum and, where thought best, also to the lumbo-sacral region. Where, as is usual, the impotency is accompanied by a certain degree of cutaneous anæsthesia of the penis, but especially where the seminal secretion is scanty, the board should be positive (ascending current); where however nocturnal spermatorrhœa, premature discharges (before coition is possible) or other irritable phenomena characterize a case, the surface board should be negative (descending current). The head of the patient should rest on a sponge thoroughly saturated with water, and communicating with the water of the bath, so as to include the cerebellum in the direct circuit. The last five or ten minutes of the bath should be devoted to passing the faradic current between the head electrode and the surface board, this last applied about the genitals, but chiefly about the perineum, the current to be of sufficient intensity to contract the perineal muscles. With anæmic patients iron should be added to the baths.



These should be taken at first daily, later on every other day, then three times a week, and so on until it becomes apparent that all the good that can be obtained from them has been obtained—whether this be a perfect cure or only a certain degree of improvement. Where it is thought requisite, internal medication and various hygienic measures may be advantageously resorted to as adjuvants. While these will do no good when employed alone, they may serve to enhance the effects of the baths.

In the following cases, I will include some where the impotency was not perfect, where the conditions were merely those of sexual debility. As there is here merely a difference in degree, it would be superfluous to separate the two conditions under distinct heads.

CASE XXV.\* *Perfect impotency.*—Mr. F., from the practice of Dr. CARO, a robust gentleman, aet. thirty-six, full of muscular vigor. Had had syphilis, the symptoms of which had disappeared under Dr. C.'s treatment. For two years the power of erection as well as sexual appetite had become extinct—if we except an occasional imperfect spontaneous erection on waking up in the morning, and even this was of rare occurrence. Ordinary medication proving inadequate, Dr. C. sent patient to take electric baths. From March 7th to July 16th, Mr. F. used the baths, averaging about two weekly. He was then, and still remains, perfectly restored.

CASE XXVI. *Perfect impotency.* A. E. K., aet. 23, commercial traveler, applied to me for treatment in the spring of 1873. His general health was very good. He had masturbated but little. Had been in full possession of his sexual power until almost twenty-two years of age, when he found that, without assignable cause, he had lost the power of erection. His general condition being, as far as discoverable, perfect in every respect, I instituted a local electrical treatment. This was continued for some time without avail. Strychnia was then administered with no better result, and after some months' treatment I told him that I could do nothing for him. He remained without any treatment whatever until the spring of 1874, when I advised him to try electric baths. He took in all about half a dozen baths, which resulted in his complete and thus far permanent restoration.

CASE XXVII. *Sexual debility.* Mr. W., aet. 32, married, manufacturer, consulted me in February 1875. Had gradually for about a year past lost sexual power. Was able to perform the marital act at rare intervals only, and when he did, felt exhausted the whole of the succeeding day. I ordered him electric baths. He took the first on February 22d, 1875. Between this date and March 22d, he took six baths. The sexual power had then fully returned. I must not omit to state that during the time he was under treatment he took, by my direction, gr.  $\frac{1}{16}$  phosphorus twice daily, which may have somewhat accelerated the result.

#### CONSTIPATION.

Atony of the *muscularis* of the intestine is admittedly the direct cause, in most instances, of constipa-

tion. It is the condition known as "torpor of the bowels." It is ordinarily due to abnormal innervation of the parts. The inefficient innervation may be—and in females frequently is—reflex, or its cause may be sought for in the central nervous system. The condition of the voluntary abdominal muscles is likewise a factor in the alvine process. Sluggishness of the abdominal (portal) circulation is a not infrequent etiological concomitant of constipation, and, finally, the conditions grouped as "dyspepsia" may form the causative feature of a case. I have mentioned these different causes simply in order to account to some extent for the almost wonderful effects in this condition of electric baths. When we consider that in every one of the morbid conditions here enumerated, electricity is a very efficient remedy, and that for the resulting muscular atony it may be called a specific, it will not appear surprising that a mode of application which brings the electric influence to bear on both cause and effect—often on a combination of several of the causes enumerated, should be attended with such brilliant results. I have thus far met with no failure in the electro-balneological treatment of constipation.

In the majority of cases the following method has proven the most efficient. The first ten minutes

of the bath should be devoted to the administration of a galvanic current, as intense as can comfortably be borne by the patient. The one pole should be connected with the head-electrode, the other, by means of the surface board, applied alternately, to the epigastrium, chiefly, and to the hypogastric region. The current should a portion of the time be ascending, the rest descending. Occasionally the current should be rapidly reversed by means of the commutator, the intensity however having been previously reduced, in order to avoid too severe a shock; this will cause efficient contractions of the abdominal *parietes*, and probably also of the intestinal *muscularis*. The second ten minutes of the bath should be devoted to faradization, employed in the same manner as the previous galvanization, only that here the direction of the current is immaterial, and no reversals are requisite. The current should be of sufficient intensity to produce energetic but not painful contractions of the abdominal *parietes*.

CASE XXVIII. Mrs. \*, aet. 55, in average health, without however being robust, had suffered from constipation for about thirty years. She had had every possible medicinal treatment, with no avail. Nothing had ever ameliorated her condition. Without the aid of a cathartic, her bowels moved but once every week or ten days. She was of course compelled frequently to re-

sort to laxatives. In the fall of 1873 I ordered her electric baths. She was not very energetic in anything, and this lack of energy caused her to take the baths less frequently than I desired her to. Had she taken them regularly, she would probably have been restored in as many weeks as it took months to effect her restoration. As it was, she took some thirty baths in the course of about fifteen months. For nearly a year past she has had a passage every day with the utmost regularity. No adjuvant treatment was employed in this case.

CASE XXIX.\* Emil Miller, a bright child two years of age, was brought for treatment July 7th, 1874. He had suffered from obstinate constipation almost from his birth. Had been under the care of several physicians, but had never received any benefit from treatment. Even with the aid of powerful cathartics, given in doses suitable for an adult rather than a child, defecation took place only once every three or four days, and was so exceedingly painful as to elicit cries of pain from the child. The feces were always hard and lumpy, and of an abnormally light color. A digital examination per rectum revealed considerable flaccidity. My diagnosis was *paresis of the muscularis of the intestine*. I ordered faradic baths. On July 12th the first bath was administered, and I must confess that the result was a perfect surprise to me. True, I had expected a cure to take place; but I had looked for gradual improvement, and was not prepared for a result such as was here obtained. *From the time the first bath was taken, defecation took place regularly once a day, without pain; the feces became perfectly normal both as to color and consistency, and the boy continues to the present day to defecate regularly and in every respect normally.* To insure permanency, the baths were continued, at first twice, then

once a week. They have now been discontinued for upwards of a year, there being no occasion for their further use. No other therapeutic measures, internal or external, were resorted to in this case, nor was any change made in the diet of the child.

### HYDRARGYROSIS.

The etiology of this condition requires no comment. I will simply relate a case illustrative of the eliminative effects of galvanic baths.

CASE XXX.\* *Mercurial Stomatitis.* Mr. S., about 35 years of age, came to me for treatment in the fall of 1872. He then had indurated chancre, two buboes and syphilitic sore throat. He had had the chancre for six weeks before applying to me, but had been, he said, ashamed to consult a physician. Before medication had had time to make any impression on the disease, roseola appeared. The syphilis was very obstinate in this patient, compelling me to keep him under the influence of mercury for a long time. In October 1873, the patient presented himself with a very aggravated mercurial stomatitis. The customary remedies, internal as well as external, made little or no impression on the affection. On November 11th, I discontinued all other treatment, and ordered a course of galvanic baths. He took his first bath on the same day. This was repeated every alternate day until six baths had been taken, when all symptoms of the disease had disappeared. He has had no mercurial trouble since then. The descending galvanic current from a zinc-carbon battery was used throughout.

## LOCOMOTOR ATAXIA.

Were it not for the remarkable results obtained in the following case, I should not have felt justified in devoting any space to an allusion to this formidable disease. I insert the case as it was published in No. 216 of the "Medical Record." I have to add that the patient, some six months ago, suffered a relapse, which however is not nearly as aggravated as his former condition, nor are the symptoms so pathognomonic. I had a letter from him about a week previous to my writing this, in which he states that he intends soon to come to the city for the purpose of taking another course of treatment. Even if the treatment however has not had the effect of curing the disease—and this I do not claim for it, it has been of sufficient importance if it has resulted in arresting for a time its progress, giving the patient temporary comfort, and prolonging life. Further trial may possibly have better results—in more recent cases—with respect to permanency.

CASE XXXI.\* Mr. W., aet. 48, came to consult me January 12th, 1874. He had then felt the symptoms of locomotor ataxia for about six years. Had been unable for several years to walk without the aid of a cane. When walking he dragged

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without a cane, and talks jocosely of running footraces. All functions are performed normally.

Although in this case the baths were not employed exclusively, yet they predominated in the treatment; and if the judgment of the patient, a very intelligent gentleman, is to be relied on, a large share of the success is due to the baths.

### CACHEXIÆ.

After what has been said in a preceding chapter of the tonic effects of electric baths, it would scarcely appear necessary to introduce the subject of cachexiæ. If I do so nevertheless, it is only to be afforded the opportunity of relating the following case, which possesses sufficient interest to render its introduction here desirable. The first portion of it has already been published (Med. Record, No 216), but to this I have to add what occurred subsequently.

CASE XXXII.\* *Mercurio-syphilitic Cachexia*.—Mr. L., æt. 27, had primary syphilis about four years ago. Subsequently had inveterate constitutional symptoms, for which he was under medical treatment both here and in Europe. When he had sojourned in the latter country some time, he was pronounced cured by his physicians. He married, and returned to this country in the fall of 1872. A few weeks after his return he fell into a gradual decline, which confined him to the house—and part of the time to bed—for eight months, during the latter portion of which he had discontinued all medical treatment. It was with difficulty that, assisted by his wife, he managed to

reach my office. I found him terribly enfeebled ; greatly emaciated ; sallow complexion. He was much annoyed by rheumatic pains, which I considered specific. His condition was so exceedingly low, that I decided to postpone all medication until he should be stronger. I ordered galvano-faradic baths, i. e. the galvanic current in the bath as an eliminative, the faradic as a tonic. The first bath was taken on November 20th, 1873. For one month he took the baths, and nothing else. He was then so much stronger, that I felt justified in instituting a mild specific course of treatment, the baths being continued as theretofore. At the end of two months the patient was nearly as strong as ever, was able to resume his occupation, and had gained twenty-seven pounds in weight.

Thus far this case was published as above stated. For the sake of the interest attaching to it, I will now proceed to give its further history. Mr. L. remained to all appearances well until July, 1874, when he commenced to suffer from headache and constipation. On the 23d of August following, while I was absent from the city, he presented himself to the gentleman who attended to my practice during my absence, with paralysis of the external rectus muscle of the left eye. He also consulted a specialist, who pronounced the paralysis rheumatic. When I returned from the country he presented himself for treatment. I commenced a series of daily electric applications to the affected muscle, which failed to respond to the faradic current, but contracted very readily when the slowly interrupted galvanic current was employed. As I had strong suspicions that syphilis was at the bottom of the trouble, I also administered iodide of potassium in gradually increasing doses—not however until electrization and strychnia employed for some weeks had failed

to do any good. The administration of the iodide met with no better success. The patient's general health gradually declined. On October 22d, he complained of numbness in the left leg, which gradually increased, the leg at the same time becoming paretic, so that the patient required the aid of a cane for ordinary locomotion. His condition now became rapidly worse. His movements became ataxic. Anæsthesia of the bladder, paresis of this and the intestine, with obstinate constipation, loss of appetite, emaciation, etc., rapidly supervened. I suspected the development of *gummata* on the meninges of the brain and cord, and advised him to use the inunction cure, and to remain at home until he should be well. This, on account of the business losses which it involved, he was very much averse to doing. He consequently proposed a consultation with an eminent physician, which was had. This gentleman pronounced the case one of spinal (either multiple or posterior) sclerosis, and discarded the syphilitic theory. A consultation two days subsequently with another physician had a like result. In deference to the opinion of these gentlemen, I treated the patient in accordance with their diagnosis. This was in the second week of November. The patient became rapidly worse. He soon ceased to walk—he tumbled about. After six days' treatment, considering his life in imminent danger, I reiterated my advice to institute the inunction cure, and the patient then acquiesced. Nov. 24th I ordered a drachm of Unguent Hydrarg. to be used every evening; I could not however prevail on the patient to remain at home during the treatment. He continued to grow worse. Nov. 26th he had complete retention from vesical paralysis, and sent for me at night to relieve him. Thenceforth until he got nearly well he was obliged to use the catheter regularly. A few days

after this, fortunately for himself, he fell down as he was leaving a horse car, and sprained his ankle. I say *fortunately*, for this accident *compelled* him to remain at home. From this time he began to improve. December 2d I substituted for the ointment a twenty per cent solution of the oleate of mercury, of which he used a drachm morning and evening. The improvement from this day was exceedingly rapid. On the 4th of December he had regained control of the bladder. The constipation, which had been very obstinate, also began to yield. From this date he used the oleate only once daily, and discontinued it entirely on the 14th. On the 10th he had already resumed his avocation, and the same month absolutely danced at a ball. He took iodide of potassium for a time after his mercurial course. He has since been and is now in perfect health.

#### DYSPEPSIA.

The remedies for this disease are unfortunately so numerous, there is so much temptation to try another where one remedy has failed, that it is seldom or never that an uncomplicated case of dyspepsia applies for electrical treatment. As a rule, the disease that furnishes cause for referring a case to the specialist, is some nervous trouble secondary to the dyspepsia.

In regard to the influence of electric baths on dyspeptic conditions, whether complicated or not, I can however speak unqualifiedly in their favor. I know of no one other remedy that can at all approach

them in this respect. Whatever the secondary or other troubles of patients, any co-existing dyspepsia was in every instance either cured or greatly ameliorated. The improvement usually begins at once—after the first or second bath, and continues steadily. As I have not had occasion to treat by means of electric baths any uncomplicated cases of dyspepsia, I can adduce none. I may safely claim however for the baths a reliability and bespeak for them a confidence that I might claim or bespeak for no other remedy or plan of treatment whatsoever—assertions which would appear rash and venturesome, had I not at my command abundant clinical evidence to warrant my making them.

#### MELANCHOLIA.

A case of melancholia, highly illustrative of the effects in this condition of electric baths, came under my notice very recently. It may serve as a guide in the treatment of this and kindred conditions.

CASE XXXIII. Mr. F., aet. 22, single, butcher, consulted me Oct. 21st, 1875, for melancholia and loss of memory, from which he had suffered for upwards of a year. He had frequently entertained the idea of suicide. A thorough examination revealed no trouble of any of the viscera. All functions appeared normal. He had never masturbated. There were no

collateral symptoms to furnish any evidence of organic cerebral trouble. I prescribed phosphorus and strychnia, and galvanized the brain twice a week. Two weeks of this treatment had completely negative results. I then ordered electric baths. Four baths resulted in a complete cure.

#### INEQUALITIES OF THE CIRCULATION.

As a very fruitful source of morbid conditions of almost every nature, abnormalities of the circulation of the blood are well worthy our attention. As is the case with dyspepsia, so here likewise patients seldom present themselves for treatment unless some definite secondary pathological condition has supervened. We find these patients complaining of cold hands and feet, irregular and disturbed sleep, occasional local congestions, with vague, usually slight pains here and there, etc., etc. Where organic cardiac disease is at the bottom of the trouble, we cannot of course expect much permanent improvement. Although even here considerable relief is often afforded while the baths are being used, their discontinuance will in all probability be soon followed by a return of the former condition. Where, however, cases are not complicated by organic disease, where we have a "sluggishness" of the circulation, due either to vasomotor inertia or atony of the muscular coats of vessels, the electric bath will be found

reliably efficient. I have already (p. 55) alluded to this subject, and explained the probable "mode of action" here of the baths. I will now offer some suggestions as to the best method of administering them with a view to equalizing the circulation.

We must here seek to stimulate the vasomotor system, both central and peripheral; to give tone to the coats of vessels, both by direct and indirect electric influence; through counter-irritation to relieve internal congestions, by causing an afflux of blood to the skin. These objects are best attained by means of the galvanic current, which should be employed of sufficient intensity to produce a rubefacient effect. The faradic current acts in the same direction, but far less energetically, if we except the vessels near the surface, the muscular coats of which are probably more efficiently tonicised by this than by the constant current. The faradic current however is applicable here in another way, and for a very important object. I refer to the *mechanical* counter-action of a sluggish circulation, through the agency of prolonged muscular contraction. This mechanical effect is not of course peculiar to the faradic current; it is shared by gymnastic and other exercises; but obtained in any other way whatsoever (with the exception, perhaps, of *massage*, which is however

much more troublesome as well as inferior, and moreover not always admissible) it involves, in order to produce perfect results, a considerable amount of bodily exertion, often beyond the physical power of persons who are in ill health, and bringing with it the risk of positive injury, through over-exertion, which with the *passive* contractions obtained by means of the faradic current, is entirely obviated. By administering the *general* faradic current in the bath, of sufficient intensity to *maintain* muscular contraction as long as the circuit remains closed, any stagnant blood in the lower extremities will be efficiently forced into the general circulation. After from three to five minutes of this faradization, the surface board may be successively applied for a minute or two each to the arms, abdomen, pectoral and dorsal muscles. I believe the *best* results can be obtained by first going through the faradic process, then subjecting the patient to general galvanization, as above indicated, and concluding by another but brief faradization.

#### AFFECTIONS OF THE SYMPATHETIC.

Last, but not least, I have some remarks to offer on the treatment by the electric bath of certain affections of the sympathetic nerve. While I do not



in any such cases accord to the baths the rank of an exclusive remedy or even a specific, their importance as an adjuvant is sufficient to entitle them to special consideration in this connection. In those neuroses of the sympathetic where electricity (galvanism) is indicated, the *greatest* benefit can be obtained from local applications. On the other hand the baths, employed in addition to local applications, will be found a very important factor in the treatment, possessing, as they do, two advantages, viz: *first*, by their means, the electric influence is brought to bear—in a much less concentrated form it is true—on the entire sympathetic system, from the *ganglion impar* to the *ganglion cervicale supremum*, and, by derived currents, on the cephalic ganglia also, at one and the same time; *second*, the rest of the body participates in the general nutrient and tonic effects of the bath equally with the sympathetic, the latter thus receiving a reflex benefit which local applications fail to furnish. There are, moreover, cases where hyperæsthetic conditions of the nerve do not admit of local applications, and where yet electricity is urgently called for. Thus I have at present under treatment a lad sixteen years of age, in whom both supreme cervical sympathetic ganglia as well as the *ganglion impar* were until re-

cently so susceptible that the mere adjustment of the electrodes caused him great pain, while on the other hand he bore the baths exceedingly well. In such cases, electric baths, suitably administered, frequently constitute in conjunction with proper medication, the most useful treatment.

As to the mode of administration in sympathetic neuroses of the baths, the most direct manner in which to influence the diseased nerve, is by connecting one pole of a *galvanic* battery (I consider the faradic current next to useless here) to the head electrode, the other to the surface board, the latter applied portion of the time to the epigastrium (solar plexus), the balance to the coccyx (*ganglion impar*). This will include in the direct circuit the main portion of the sympathetic, the position in the tub of the bather bringing the cilio-spinal centre very close to the head-electrode. The direction of the current must be determined by the individual features presented by each case, as also the duration of the bath.

CASE XXXIV. Mr. S., aet. 31, merchant, was referred to me April 3d 1874, by Dr. KREHBIEL. In January, 1874, Mr. S., until then in the enjoyment of good health, woke up one morning to find, as he expressed it, "everything dark before his eyes." He groped his way to the window, in order to open the blinds. When at the window, he felt as though about to fall

out—probably vertigo. He soon returned to an apparently normal condition, and went about his business as usual. A week after, he had a much more serious attack, which he describes as follows: "I had been playing whist during the evening (several hours), when suddenly, without premonition, I felt as though a champagne cork popped against the top of my head, inside. Accompanying this was an indefinable sensation about the heart, as though the blood all rushed thence down to the feet. I did not lose consciousness; did not fall. I trembled all over, and a great fear came over me. Felt very weak all night; my pulse was very slow." About two months subsequently, patient was referred to me, as above stated. He then had an uneasy look; an indefinable continual sense of fear; was excessively nervous in the forepart of the day; had brief attacks of tremor—usually every alternate morning, but not typical as to time of occurrence. The history exhibited neither syphilis, malaria nor intemperance. Had never had headache. Sleep good; appetite likewise. The most pathognomonic symptom, however, related to his pulse. This was abnormally slow, ranging from 44 to 54 (the latter only when standing or after walking) per minute. It was full and regular. There was no organic heart trouble. In the absence of any other symptom whatsoever pointing to irritation of the pneumogastric or spinal accessory, I was justified in excluding this as the possible cause of the cardiac infrequency. On the other hand, the pathogenetic manifestations appeared all to point to "asthenia of the sympathetic"—at any rate the portion of this whence the cardiac nerves take their origin, and I formed my diagnosis accordingly. In the beginning, the treatment consisted of bilateral ascending (from cilio-spinal centre to both mastoid fossæ) galvanizations of the sympathetic, and galvanic

baths (head electrode negative, surface board positive, to epigastrium) on alternate days. Improvement in every respect was steady, though not rapid. At the end of three weeks, I supplemented this treatment by the administration of ergotin and nuxvomica. At the expiration of two more weeks, the patient being nearly recovered, I discontinued these medicaments, substituting the valerianates of zinc and iron, and steadily maintaining meanwhile the electrical treatment as above indicated. After a short time recovery appeared complete, and patient was discharged from treatment. He returned however a few months subsequently, complaining of "faint spells" in the mornings, accompanied with excessive nervousness, and a renewed though moderate cardiac infrequency. Electrical treatment, similar to that above described, soon restored him. One or two more slight relapses occurred during the next six months. For over a year past however Mr. S. has been in the enjoyment of perfect and undisturbed health. His normal pulse ranges from 72 to 80.

Whoever is familiar with the physiological effects of electric baths, will readily concede their great utility in a variety of conditions that I have not thus far specially alluded to. Of such I would mention ASTHENIÆ, ATONIC AND DEBILITATED CONDITIONS GENERALLY, including the state of CONVALESCENCE FROM ACUTE DISEASES and the DECLINE OF ADVANCING AGE; many cases of CHRONIC HEADACHE; some INCLASSIFIABLE CONDITIONS OF MARASMUS and MALNUTRITION, etc., etc. In all such cases, when purely functional and uncomplicated by incurable

ble organic disease, good results may be confidently looked for.

With these remarks I conclude my subject. Whichever the errors that a too limited experience may have engendered—and I doubt not there are many, I cannot on reviewing my work accuse myself of lack of candor nor yet of undue enthusiasm. I have cited but a small proportion of the successful cases whereof I possess records; still I believe that I have adduced amply sufficient clinical proof of the great value as a remedial agent of electric baths, and of the desirability of their more general adoption. I would more especially call attention to the inappropriateness of deferring their employment until almost all other remedies have been exhausted; and when I reflect that pretty much all those cases that had been referred to me by other physicians had already had the doubtful benefit of almost every other conceivable treatment, while many of those who came of their own accord, had in addition made the rounds of all the quacks, and exhausted nearly all the nostrums that are to be found advertised in the columns of our daily papers, the wonder seems that the results obtained were as good as they have been. I sincerely trust that in the future phy-

sicians will avail themselves more frequently than heretofore of a remedy that is certainly capable of accomplishing much good ; and I hope that in addition to myself there will be found others, more competent, to devote themselves to the study of the subject. To these, and perhaps to myself at a future time, I relegate the task of correcting my errors and promulgating hitherto undiscovered truths.



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a considerable time.  
 For sea-water baths it is not enough to simply add salt to the water. The invigorating and tonic effect of a sea bath is owing to the iodine contained in the water, and to obtain this result artificially mix together a peck of coarse salt, four ounces of iodide of potash and two ounces bromide of potash. Add a handful or so of this mixture to your bath and its effect will be bracing and tonic. This is the only medicated bath I can recommend, but of course there are plenty more that you can easily try by simply making the additions to the water, as indicated by the names. Thus for rheumatism, vichy, turpentine, saltpetre, tansy, pine-needles, &c., are sometimes added. For nervousness there are some people who use a bath of weak tea. Milk, and even blood, have been used for baths, and the practice of covering the body with hot sand or even mud from the vicinity of a mineral spring, is very ancient. An electric or galvanic bath is easily arranged and is much used for rheumatic troubles. Simply drop one ponce from your electrical machine into the water and hold the other in your hand as you lie in the bath, and regulate the strength of the current to your







Dr. WM. H. NEWELL.



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